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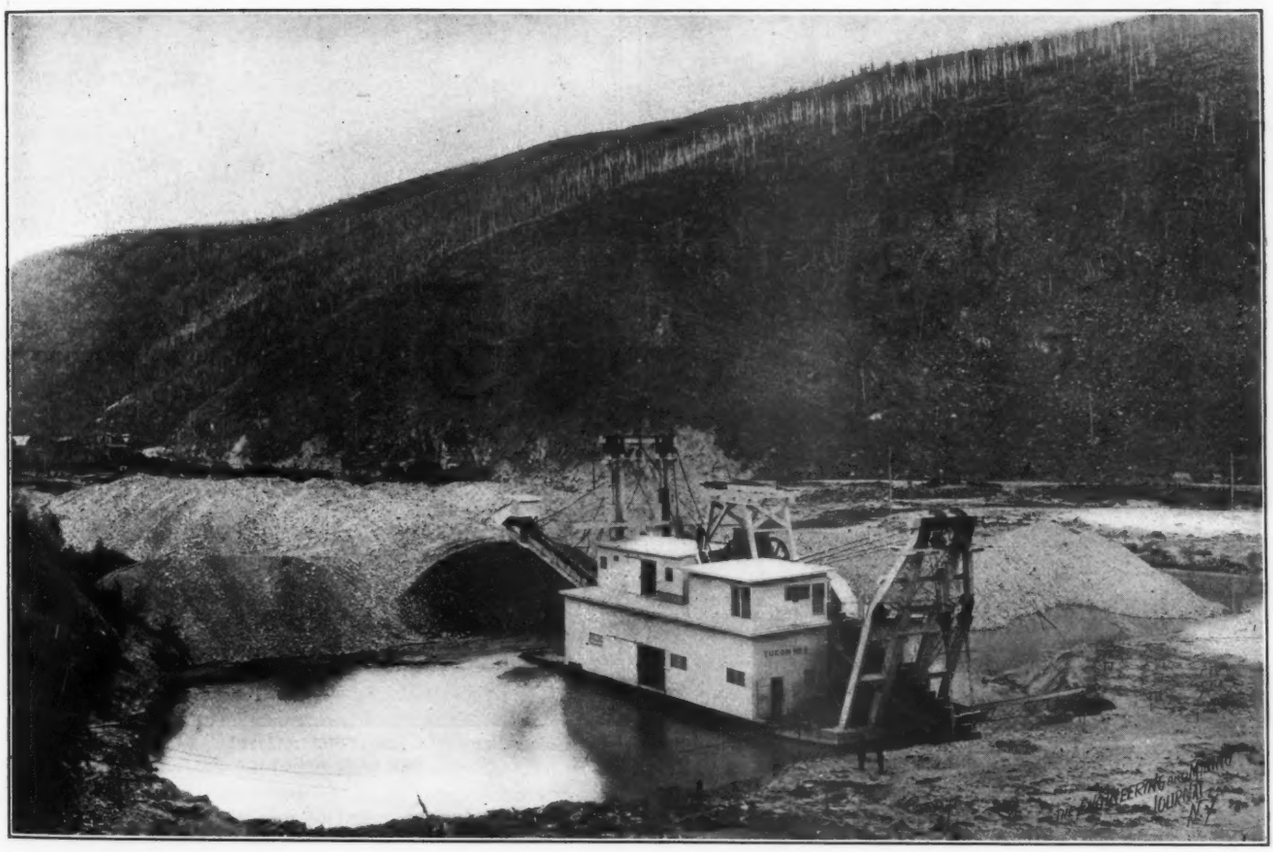
Development of Dredges for Placer Deposits

Size of Buckets Has Increased from 3 Cu.Ft. to 13 1-2 Cu.Ft. in Favorable Gravel. Buckets of 8 Cu.Ft. Capacity Most Common

BY GEORGE B. MASSEY, II*

The gold dredge has taken from placer mining much of the glamour which has surrounded it, but it has elevated it from a haphazard calling of the more adventurous spirits to an industry which demands technical and systematic attention. For the last 25 years the dredge has been undergoing a process of evolution, and it is only within about six years that it has attained the excellence which enables it at the present moment to claim the interest of the investing public.

The first gold dredges were built in New Zealand. They were small, light machines, with inadequate power and of little capacity. Their owners were content with a very small interest on their investment. In the course of time some were built in the United States and used in California. As they were found to be too light for the work attempted, development commenced. Much of this development was ill-advised, as the great number of unsuccessful dredges throughout the West will bear witness.



GOLD DREDGE AT WORK ON BONANZA CREEK, YUKON TERRITORY

Two Types of Dredges Abandoned

Two distinct types have been tried and definitely abandoned. One of these is the dipper dredge which has a crane or boom extending over the bow and carrying a long handle at the end of which is a large dipper. The boom may be revolved and the dipper can excavate all of the material immediately in front of the dredge. The bottom of the dipper is closed by a door which is opened when it is desired to dump the excavated material into the hopper of the screening and washing apparatus. The trouble experienced was that the dipper deposited large amounts at irregular intervals and so made washing difficult and irregular and also that the water and most of the gold would run out of the crack around the door. No practical means of preventing this have been found.

The other type abandoned was the hydraulic dredge. In this device the water, gravel and gold are sucked up a pipe by a centrifugal pump and discharged into the washing apparatus. But as gold is many times heavier than either gravel or water, it naturally had a tendency to remain where it was while the gravel and water were elevated. This was invariably found to be the case.

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The Chain-bucket Dredge

The elevator dredge, or chain-bucket dredge as it is sometimes called, has an endless chain of buckets carried on a long, steel ladder extending from above the hopper on the dredge down into the water. As the chain is pulled upward each bucket slowly fills with gravel and water, all of which is elevated—each bucket being watertight—to the hopper where, in turning to go down again the buckets are inverted one after the other over the hopper, and deliver practically a steady stream of material to the washing apparatus.

Gold will settle very readily in the gravel when it is agitated, but the action of the buckets in filling is so quiet and steady that the gold has no chance to settle or get away. The elevator dredge is, therefore, acknowledged as the only satisfactory type for working placer ground. The size of a dredge is given by stating the capacity of each bucket in cubic feet. Seven years ago the most successful dredges had at that time buckets of 3 cu.ft. capacity. They soon gave way to the 5-ft. machine, while at present the dredges with 7½- and 8-ft. buckets are found in greatest numbers. There are two dredges near Folsom, Cal., which have 13½-ft. buckets that are working successfully in a loose gravel which digs easily.

Speaking in a general way, the larger the dredge the less the cost per yard of gravel handled, as the larger output is obtained with practically no increase in labor cost. A 5-ft. dredge is often installed on a placer property to start operations and this followed with 7½-ft. dredges.

Operating Conditions Severe

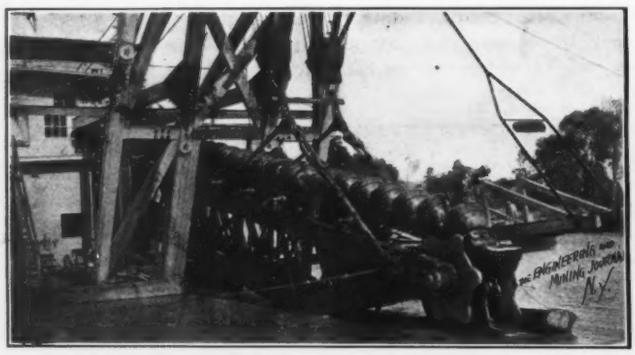
It may be safely said that no machinery is called upon to operate under more trying conditions than are present in placer dredging. The gravel, sand and water form an ideal wearing mixture which cuts in a short time anything but the very best of material. Repairs have to be made constantly to offset this action and they form a large part of the total cost of operation. The question resolves itself not into avoiding repairs, but into keeping them as low as possible in comparison with the amount of material excavated. Breakage is avoided by using only the best machinery and material obtainable.

The first cost of a dredge is small, when compared with the cost of repairs where inferior machinery is used, and it should not form an obstacle in the way of purchasing the best machinery on the market. The best dredges now built will run 21 hours per day out of the possible 24. The three hours lost time are due to repairs and the periodical "clean-up" of the gold.

Low Dredging Costs in California

The dredges in California are operating more cheaply than it is possible to do elsewhere. The reason for this is that the gravel is somewhat easier to dig and wash than the average encountered in most other districts; in addition, there are in each case several dredges under one superintendent so that the office expenses, superintendence and other fixed charges are less per dredge. Other features which tend toward cheapness are the low-priced electric power and the excellent labor obtainable. There are so many dredgemen who live in the vicinity that the wages are much less than the same men would demand in most other localities.

In almost every prospectus of gold-dredging companies in which the public is asked to join, the California costs are given as average dredging costs. This is far from being the case and is extremely misleading. In the tropics the labor cost may easily be twice that in California, and the fuel cost greatly in excess on account of procuring fuel and putting it on board the dredge. The chances are, too, that the best men cannot be obtained and the poorer labor used results in more expensive repairs to the machinery. In other localities it is impossible to work all the year round and the shorter season reduces the yardage and makes the overhead charges per yard greater. In countries like Alaska and Yukon Territory, it is necessary to thaw the frozen ground be-



LADDER, LOWER TUMBLER AND CLOSE-CONNECTED BUCKET-LINE

LOOKING BACK ALONG THE EDGE OF THE CUT

SLUICES AT STERN OF A 13-FOOT DREDGE

THE TAILINGS STACKER

fore the dredge can dig it at all. In Burma the season of rain precludes dredging for many weeks each year.

The Dredge Crew

In addition to a superintendent, who may attend to several dredges, the crew on each dredge consists of a dredge captain and an "extra man," as he is known in California, who is capable of taking the place of the captain, or of any of the other men who may be off. They work usually 10 hours. The dredging day is 24 hours, divided into three shifts of eight hours each. On each shift is a winchman who occupies the "pilot house" or winch room, where are located levers to enable him to absolutely control every movement of the dredge. There is also an oiler on each shift who looks after the lubrication and the flow of water.

If the dredge is steam-driven a fireman must be added to each shift. In addition to the above, it is necessary to have two deck hands, who work 10 hours during daylight shifting the electric-power cables, grubbing in front of the dredge, planting "dead men" to which to fasten the swinging lines, building dikes to keep the pond level at the proper hight, assisting in making repairs and, if a steam-driven dredge, procuring fuel and putting in on board the dredge.

The wages of these men in California are: Captain, $125 per month; extra man, $3.25 per day; winchmen, $3 per day; oiler, $2.50; deck hands, $2.50. As a rule, this does not include board or lodging, the men "finding" themselves. Often a bonus is given for good yardage. Logs are as carefully kept as in the engine room of a battleship, with meters to show the amount of power used, and an explanation for each minute of shutdown. The ground is surveyed in front of the dredge and the area worked is put down. A recording device is also in use which records the depth of digging for every moment. In this way the exact yardage is computed.

It is the custom to shut a dredge down for a half day every two weeks to "clean up." This is done by two men who do not usually belong to the crew. The material on the gold-saving tables is washed in a small sluice and the gold recovered. It may not occur to the average reader that a man may be about the dredges for weeks without so much as seeing a "color," since for every pound of gold recovered about 6,000,000 lb. of sand and gravel have to be handled.

Treatment of the Gravel

After the dredged material is dumped from the buckets into the hopper it passes into a revolving screen, or over shaking screens with holes varying from ¼ to ⅜ in. The water for washing is sprayed under pressure on the material as it passes over the holes in the screens. The water, gold, sand and small pebbles pass through the holes and down over the large area of gold-saving tables where the gold is caught and the water and sand pass on to the stern of the dredge where they flow back into the pond. The larger pebbles and boulders which could not pass through the holes are discharged at the lower end of the screens on an endless rubber belt which is carried on the tailings-stacker frame. This conveys the large material astern and upward to a sufficient hight to allow of the disposal of all the material the dredge digs without crowding in upon the stern of the dredge.

The tailings as stacked have a natural slope of about 35 deg. from the horizontal, while the maximum angle at which gravel can be carried up the belt is about half that angle. The water used is furnished by centrifugal pumps of the proper size and speed to deliver the required quantity of water at sufficient head to thoroughly disintegrate the dredged material and carry it over the tables.

BOW OF 13-FOOT DREDGE

A large amount of experience is essential in the designing of a well balanced dredge. It involves a complete knowledge of the requirements of the case from both a theoretical and a practical standpoint, and the latter point of view can only be had from a critical examination of the dredges in operation.

Experiments with Broken Hill ore are to be made by Dr. Gustav de Laval, at London, using his cyclone process. The experimental plant to be installed there will also be used for testing ores from other parts of the world.

Since the discovery of chrome ore in Beluchistan in 1903, at least 19 small mines have been developed yielding, according to *l'Echo des Mines,* an annual output of 7000 tons.

Gold Mining in the Transvaal

Special Correspondence

At the annual meeting of the Chamber of Mines, J. J. S. Langerman, of the Robinson group, was elected president in succession to Lionel Phillips. In moving the adoption of the report for 1908, Mr. Phillips said that the year had been marked by extraordinary progress in the gold industry. Never before were the prospects so bright or so stable. He congratulated the industry on the undoubted development of the native labor supply. The output for 1908 rose over two and one-half millions, bringing the total output of gold in the Transvaal since 1884 to £227,084,385. With the exception of £11,360,000, the whole had been produced on the Witwatersrand. The number of tons crushed exceeded those in 1907 by 2,670,000. Dividends had increased by £1,659,670. The total dividends paid by the Transvaal gold mines up to 1908 had amounted to £55,041,587. The profits earned by the producing companies equaled a distribution of 8.79 per cent. on the market value of the shares on Dec. 31, 1908.

The Transvaal in 1908 contributed 34 per cent. of the world's output of gold. The profit per ton milled by all the companies exceeded that in 1907 by 2d., despite the deliberate milling of ore with 2s. 7d. less per ton, hence the working costs had fallen by 2s. 9d. per ton. Owing to a fall of 2s. 4d. per ton in the working cost of sixty-seven of the principal producing mines, these had been enabled to include in their total reserves of payable ore an additional 5,400,000 tons, an increase of 9 per cent., though there was still room for a very considerable farther reduction.

Mr. Phillips emphasized the point that the lower the working cost, the longer was the life of the industry. The development of many of the deep mines during the past year had given such encouraging results that most of the engineers were of opinion that no appreciable diminution in the average yield, down to the present depths, need be predicted. The immense life of the industry was due to the slow rate of increase in the temperature of the earth, only 1 deg. F. being registered for every 255 ft. in depth. At this rate only 92 deg. would be attained at a depth of 7000 ft. vertical, being a much greater depth than any reached in the mining world.

Dealing with the expansion for 1909, he said it was probable that the amount of ore crushed would exceed that in 1908 by 3,500,000 tons. He contemplated an increase in the crushing capacity of the machinery of over 5,000,000 tons per annum.

An Electrically Operated Suspended Railway

By Alfred Gradenwitz*

An interesting suspended railway operated by electric power was recently installed for the blast furnaces of a Belgian metallurgical works. This installation is especially remarkable for the configuration of the tracks and for the exceptional weights of the loads to be handled on an industrial railway of this type. As the track winds about the plant it is made up almost entirely of a number of curves, only a few sections being on straight lines. The shortest radius of these curves being 7 meters, the train frequently describes a complete semi-circle.

On each trip about 15,000 kg. (33,100 lb.) of various iron ores are to be transported from the ore bin to the mixing hoppers. It was decided to use trains made up of a number of suspended cars, the motive power to be supplied from an electric locomotive equipped with a motor of 25 horsepower. This locomotive, a good view of which is shown in Fig. 3, is provided with a complete electrical equipment similar to that of any electric locomotive running on the ground, viz., controllers, fuses, substantial brakes, sanders, etc. Having no grounded rail the current is carried by a double-wire system, the wires being placed on either side of the rail and collected in the usual manner by sliding bows. Considerable power is required in starting on account of the numerous curves and the weight of the train, and in order to allow the starting torque of the motor to be fully utilized, the tractive weight of the locomotive is raised to about six tons by the addition of artificial ballast.

The driving wheels of the locomotive and the wheels of the car trucks run upon the lower flange of an I-beam, 500 mm. in hight (19.7 ft.). The lower level of this I-beam is 2.555 m. above the ground. The running rails are fixed on brackets attached to the ore bins or buildings. Wherever such brackets could not be fitted to the walls of the neighboring building, independent bents of structural steel have been provided. In view of the heavy loads, all switches were designed as stub shifting switches, running on idlers like traveling paltforms, and having one rail curved and the other straight to connect with the curved or straight sections of the track. These switches, which are illustrated in Fig. 2, are operated from the ground by means of chains acting on the shifting mechanism of the platform.

The cars of the suspended railway are of various designs, according to the requirements of the works, their contents varying between 600 to 1800 liters (21.2 to 63.6 cu.ft.) Those cars which have a capacity of over 1200 liters (42.3 cu.ft.) are self-discharging trucks, the ore being discharged through valves in the bottoms, which are unlocked at destination by the operator and locked automatically by means of a special device designed to strike against a jack, after which the trucks are immediately ready for another charge. Those cars designed for 1200 liters and less are tilted by hand by a releasing lever, but they are also automatically raised and fixed in position for a new charge. The suspended railway illustrated in the acompanying engravings was installed by A. Koppel, Ltd.

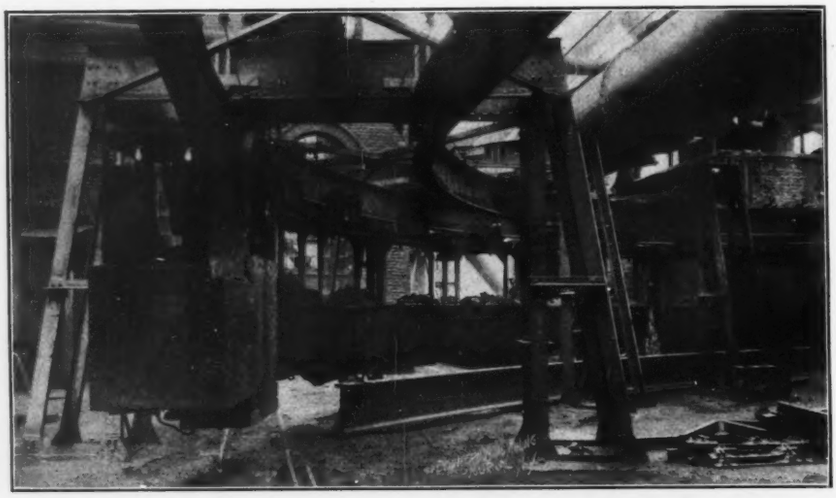


FIG. 1. AN ORE TRAIN ON THE SUSPENDED RAILWAY

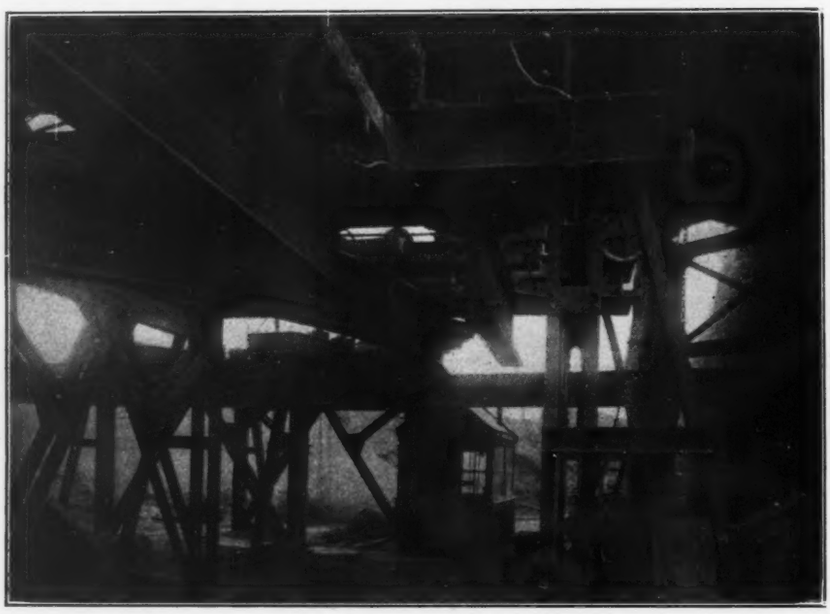


FIG. 2. OVERHEAD SWITCH AT ONE OF THE CURVES

FIG. 3. SUSPENDED ELECTRIC LOCOMOTIVE

*Regensburgerstrasse 3, Berlin, W. 50., Germany.

Slime Settling before Cyaniding

An efficient and novel method of slime settling has been developed by Horace G. Nichols[1]. The principle involved is that of removing the solid matter as it reaches the bottom of the tank in which it is settled. The effect is two-fold. It is found that the solid matter settles very compactly when not allowed to accumulate, and its removal prevents the thickening of the liquid above, which is one of the principal causes of the slow and imperfect settlement of slimes.

It is well known that retardation is a function of the depth measured from the top of the still turbid portion of the liquid, to the bottom of the vessel, and an increase of suspended matter causes a decrease in the rate of subsidence[2].

When distilled or hot water is employed, there is a noted acceleration in the settlement of slime. This is due, doubtless, to the reduced density of the medium. This indicates the marked effects on settlement which may be produced by very small variations in the specific gravity of the liquid.

It occurred to the author that if, in place of providing a receptacle for settled slimes, such slimes were removed as fast as settled, the specific gravity of the medium would not be allowed to increase toward the bottom of the settler, and the settling would so be accelerated.

Experiments were made in British Columbia on an ore of quartz with argillaceous material containing about 2 per cent. of sulphide of iron, zinc and lead. Particular care was taken to separate out the heavier and coarser portions from the pulp to be used. This was effected by crushing in a stamp battery furnished with a very high discharge, and passing the pulp through a hydraulic classifier.

An apparatus consisting of a pyramidal tank about 4x5 ft. connecting at the bottom through an 8-in. square aperture with a closed box was constructed. A 10-in. belt, *C* in Fig. 1, was made to travel slowly in the closed box. A tank was provided with a trap door just above its connection with the box *B*. This door was arranged so that it could be opened from above as desired and so allow of free passage between the two vessels.

In carrying out the tests a charge of pulp from the agitator vat was run into the tank *A* and the trough *B* was filled with water up to the same level. While all the pulp was still in suspension, air agitation being used, the trap was removed and the belt run in the direction of the arrows at a speed of 4 ft. per minute. The solid matter was removed from the belt by a scraper.

It was found that the finest slime was carried out of the tank and discharged by the belt. It did not tend to accumulate in the tank and under the belt. In some cases the average discharge of a finely crushed ore did not contain over 25 per cent. of moisture. When a pulp containing 40 per cent. of solid was treated the initial discharge carried only 22.5 per cent. of moisture. Such a discharge is more comparable with that of filters than with the product of settling tanks.

Method of Application

It is found that in practice this method of slime treatment may be applied in one of two ways: (1) It may be used as an intermittent process in which a charge of pulp from an agitator vat would be run directly to a separator which would be of sufficient capacity to hold the whole of such agitator charge in addition to a residual charge from a previous operation. The object of this provision being to allow of extracting on the belt only such proportion of the solid contents of a separator charge as could be effected with the economic minimum of moisture. The belt discharge from this separator would be delivered into a second similar tank, with the addition of a weaker solution or of wash water, or of both. The liquid so added may be sprayed upon the discharging belt in such a way as to loosen and disintegrate the discharged slime, or a mixer may be added for that purpose.

After the withdrawal of the required proportion of the solid contents and classification of the solution left in the tank, the latter would be withdrawn either by decantation or suction, to the original level, thus permitting of the introduction of a second charge. (2) It may be applied as a continuous process by the simple introduction of a suction and filter. The percentage of moisture carried over in the discharge varies inversely with the percentage of solids in the separator charge. The first portions of a discharge from any given separator charge are always better than the succeeding portions. It consequently follows that if the density of a separator charge is maintained at its initial density the percentage of moisture in the discharge will be kept at a minimum and the rate of discharge will be materially increased. It has been found that when provision is made for keeping a filter or screen surface free from accumulated caked slime, which may be done by providing an automatic periodic cutting-off of the suction applied to such filter or screen, and applying a small back pressure it is possible to withdraw continually clear solution from a pulp having as high a specific gravity as 1.4.

When the belt and suction are so correlated with regard to a given supply of pulp that when the one removes the solids the other takes out the proportionate amount of solution, a continuous supply of pulp can be kept running to the separator which would then always contain a charge of uniform specific gravity.

In applying this method to cyanide treatment, it may be noted that in other processes the completeness of washing is dependent upon time and capacity of the plant, inasmuch as each instalment of slime is taken separately and the washed solution passed through it as long as possible. Then it has to be removed, whether perfectly washed or not, to make room for the next succeeding instalment.

In the method described, continual progression through the plant is unimpeded, and the slime may be washed with any reasonable amount of weak solution desired, without in any way affecting the time of treatment, the only factor affected being the capacity of the extractor boxes.

The conveyer belt takes the place of the usual means of transference, such as pumps, carrying machinery, etc., which are employed for filtering slime. Gravity alone performs the separation by reason of the possibility of taking advantage of the principle of free settlement.

The separation of sands from slime is not called for. Consequently, the many disadvantages attendant upon attempts to deal with such classes of material as depend upon close classification are obviated. The best results from the treatment have been obtained from charges of high percentages of solids. It is probable that the only limit to the thickness of a charge is the point at which it will not run. This feature is of great importance as it is only necessary to run the charge from the agitator to the first separator and, consequently greater opportunities are afforded for preliminary decantation and thickening of the agitation charge.

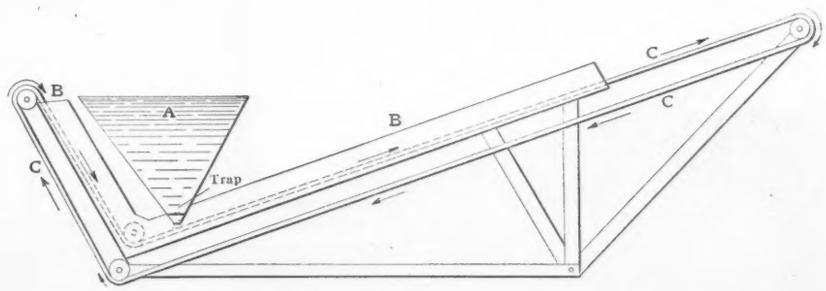


FIG. 1. MACHINE FOR SETTLING SLIMES UPON AN ENDIESS BELT

[1]Bulletin No. 41, Inst. Min. and Met., Feb., 1908.

[2]Julian & Smart, "Cyaniding Gold and Silver Ores," p. 219.

Metallurgical Treatment of Mount Morgan Ores

The Chlorination Processes Employed Were Developed to Suit the Peculiarities of the Ores. Copper Ores Are Smelted in Usual Way

BY J. BOWIE WILSON*

The Mount Morgan Company started with the usual stamp battery, but the poor recoveries soon convinced the management that this method of recovering the gold was quite unsuitable for the ores. The extreme fineness of the gold and the slimy nature of the oxidized material made it impossible to amalgamate a large proportion of the gold. After the battery had been found to be inefficient, experiments were made with Berdan pans, Wheeler pans, arrastres, Watson and Denny pans and Chilean mills, but all without success.

Experiments were then made with different chlorination processes, and it was found that if the oxidized ore was first calcined the gold could be leached out with chlorine. The calcination was necessary to dehydrate the ore and to convert it into a leachable product. Finally a barrel-chlorination process was installed and the old lower and upper works were first erected for this method of chlorination.

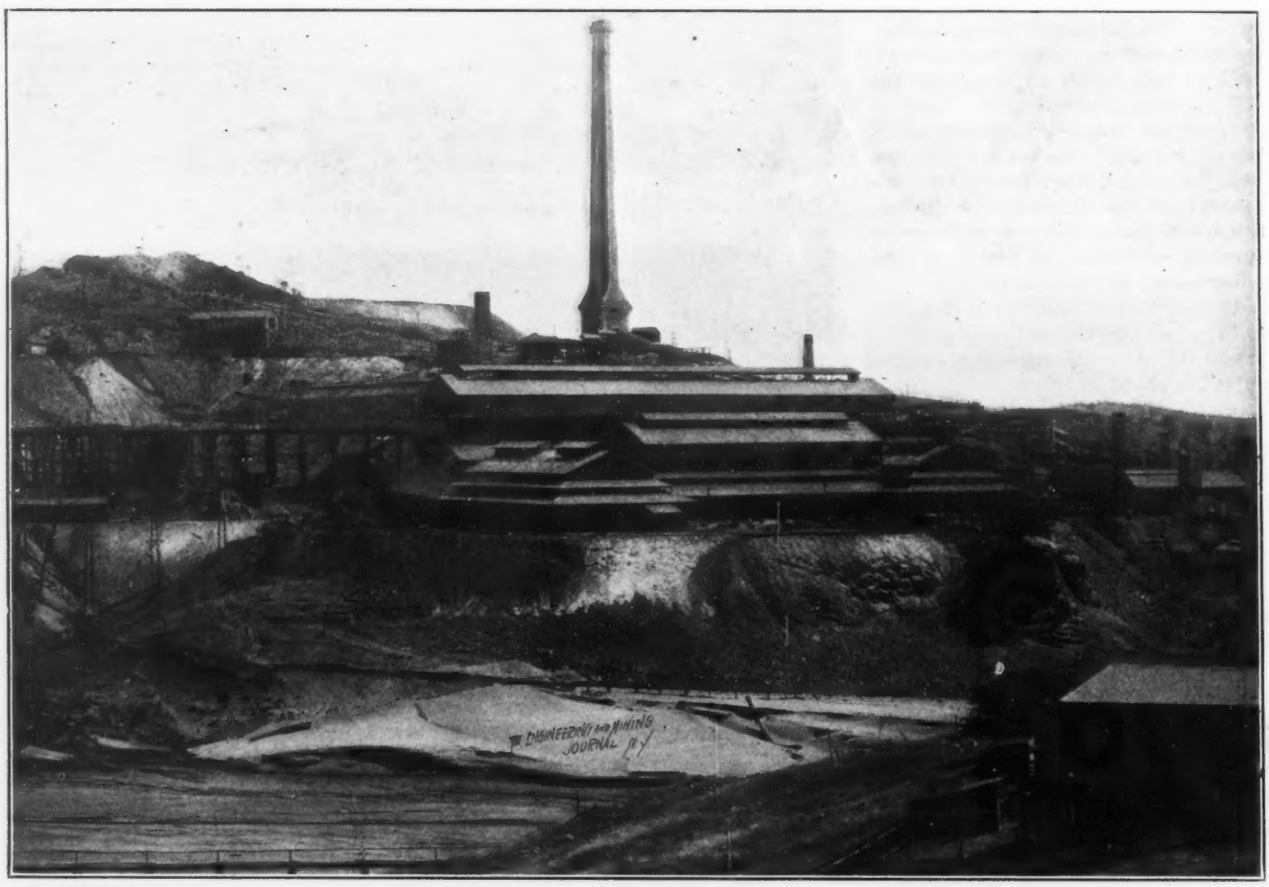
The ore delivered from the mine was dry crushed in Krom rolls after having first been dried in revolving dryers. The finely ground ore was then calcined in reverbatory furnaces, 11x10 ft., taking a charge of about one ton and requiring about three hours to finish. The hot ore was cooled upon a large floor and then trucked to revolving barrels holding about one ton, and water, bleaching powder and sulphuric acid added and the barrel slowly revolved for between two and three hours.

The barrels were made of hardwood and lined with lead. When the barrels had sufficiently treated the ore the charge was emptied into vats placed below and having a sand filter in the bottom, and the gold chloride was leached out with water and the gold precipitated upon charcoal bedded in filters.

About 1892 the barrels were superseded by the Hall-Richard method of chlorinating which consisted in leaching the calcined ore in open vats with a solution of chlorine in water, it having been discovered that the old idea that nascent chlorine was required to dissolve gold was erroneous, and also that an equally good extraction could be made in open vats as under pressure in the barrels. This of course led to a great reduction in the working costs as the barrels were heavy to wash and costly to keep in repair.

The chlorination process as used today was described in a recent issue of the JOURNAL. The description shows the improvements that have been made since the first chlorination plant was erected.

The chlorine for making the solution is generated in stills made of slabs of sandstone from manganese ore, salt, and sul-



MOUNT MORGAN COPPER WORKS—LOOKING NORTH

*Mining engineer, Sydney, N. S. W.

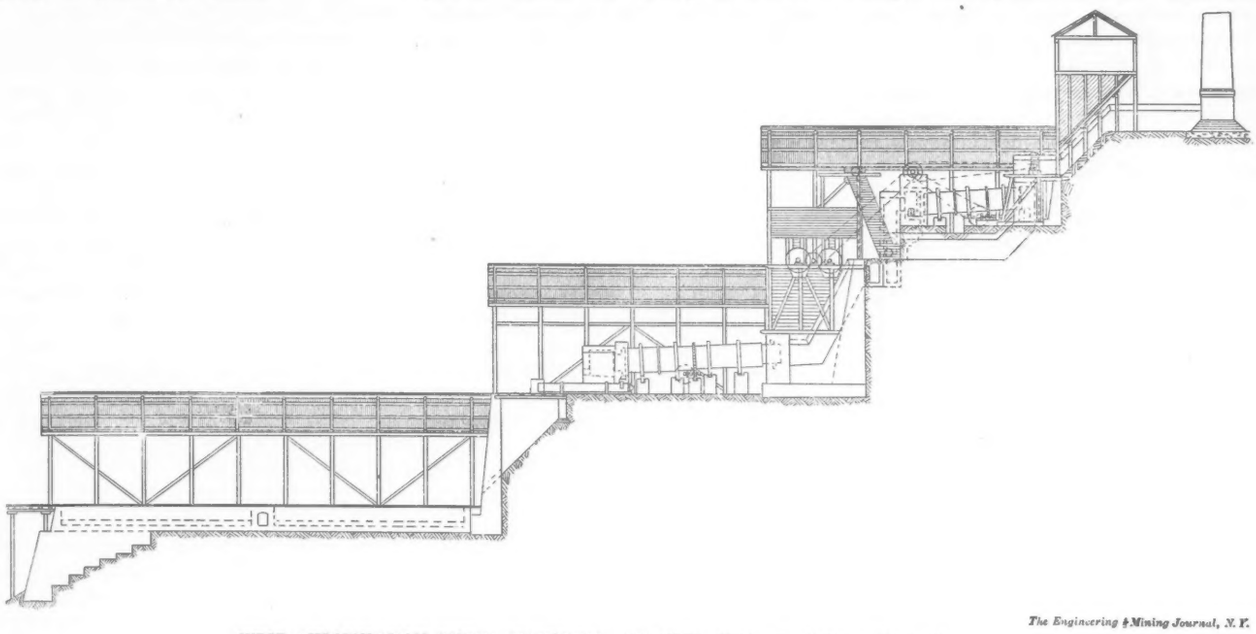
phuric acid, the mixture being heated and kept mixed by jets of steam entering at the bottom of the sides. The chlorine gas is led in earthenware pipes to the bottom of concrete scrubbing towers where the gas rises against a falling stream of water and is absorbed by it. The strength of the solution used is generally 80 grains per gallon.

tralia where one furnace was erected, and thrown out of commission after a short trial.

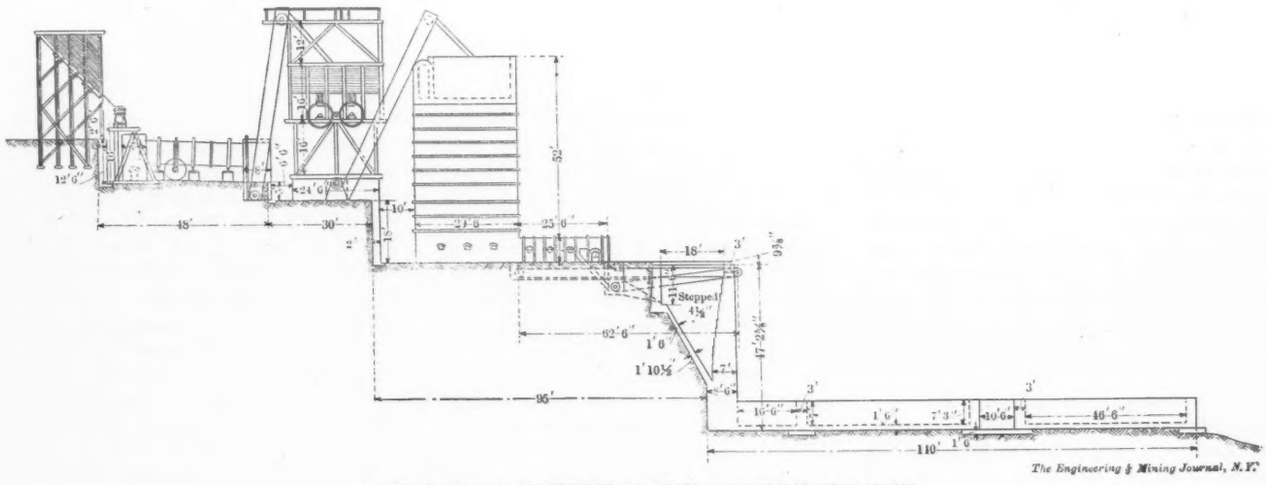
These furnaces have given good working costs but their first cost is great and would have been prohibitive if it had not been possible to make firebricks locally. It can readily be understood that finely ground heated ore falling in showers through a current of heated air will result in a large amount of dust being formed and the amount of ore thus carried away is large. This is a great defect in the furnace.

chute, 3 ft. x 10 in., in its center over which the ore trucks are emptied, so that a proportion of the ore falls through the bottom of the bin on the floor below and is taken as a sample.

The Queensland Government Railway has a siding to the top of these bins, so that all coke and limestone can be discharged directly into the bins. Each bin has a capacity of 4000 cu.ft. and the hight of the rails above the feed floor is 31 ft.



WEST CHLORINATION WORKS HANDLING OXIDIZED ORES AT MOUNT MORGAN



MUNDIC WORKS AT MOUNT MORGAN—SECTIONAL ELEVATION

The mundic works was completed in 1900 and is constructed in two sections. The general arrangment of the plant is similar to that of the plant which treats the oxidized ore with the exception that, the ore being a sulphide, Richard's shaft furnaces replace the cylindrical calcining furnace. There are four of these furnaces in each section or eight in all. These furnaces were designed and patented by G. A. Richard, the general manager of the company, and have not been tried on any other works with the exception of that of the Boulder Main Reef Company in West Aus-

The copper-smelting plant was completed in 1906, but it was enlarged in 1907 and now consists of four blast furnaces of which three are kept in blast and one in readiness to blow in. The bins for the storage of ore, iron ore, limestone and flux are built in rows four deep immediately behind the feed floor and paralell to it. There are 64 bins in all and in the first two rows each bin has a sampling

On the feed floor the materials for the charge are weighed separately upon weighbridges in hand charge cars. The cars are tipped upon iron plates (water cooled) at the mouth of the furnace and the mixture is shoveled in.

The furnaces are built of two tiers of mild steel water jackets the bottom jackets being 7 ft. and the top 4 ft. high. There is 8 ft. of water jacketing above the tuyere level. Each furnace has 40 tuyeres spaced 9¼ in. apart and 3¼ in. in diameter.

Open-Tank Method of Preserving Timber*

By Howard F. Weiss†

The successful impregnation of wood with preservatives without pressure was first brought before the public in 1867 by Prof. Charles A. Seely, of New York. The principles which Professor Seely then described are the ones mainly followed in the process as it is employed at present, yet, owing to the low price of lumber and the comparatively inexhaustible supply of timber, the open-tank process attracted little attention until in 1904 the Forest Service began to test this process at the Louisiana Purchase Exposition. At the same time a similar series of tests were made at this exposition by the promoters of the Guissani process, which is based upon principles almost identical with those used in the Seely process. There are, I believe, two commercial plants in Italy which are successfully treating wood by the Guissani process.

Since 1904, the Forest Service has carried on a number of tests in various parts of the United States in order to develop the open-tank method. Different kinds of wood have been tested, for all sorts of purposes, in coöperation with telephone, mining, lumber and railroad companies. As a result, enough information has been obtained to place this process on a sound, practical basis.

Seasoning Wood

All wood is more or less porous, and contains various amounts of air and water. As no preservative can be forced into wood while it is thoroughly saturated with water, it is necessary to reduce the amount of moisture in it. In the open-tank method this is accomplished chiefly by air seasoning, but there are drawbacks to this method of seasoning owing to the large storage yards required, the considerable stock of timbers which is tied up, subject to fire risk and accumulating interest, and finally the demands of business often require that timber shall be treated as soon as possible after it has been felled in the woods. Besides, if timber not properly piled is held for a long period in the seasoning yard, it is liable to decay, especially if the atmosphere is warm and damp. On this account quicker methods of seasoning have been adopted especially since the rapid increase in value of lumber. There are two methods for quickly seasoning timber, seasoning by means of steam and seasoning by means of oil. The saturated steam method is practically the only one used now, for the difficulty of preventing charring of the wood, when superheated steam is used has caused the abandonment of its use. The chief objection to saturated steam is that it does not dry out the wood, but only heats it; consequently a vacuum must be subsequently applied in order to remove the moisture from the wood. In the oil-seasoning method it is different, for when green wood is steeped in oil at a temperature above the boiling point of water, the water is evaporated and driven away. As yet few plants employ oil as the heating medium, but it seems highly probable that this method will come into prominence in the near future.

Oil drying is used in the open-tank method to prepare green timber for the reception of the preservative, but owing to the greater length of time and the greater expense of drying out wood containing 80 per cent. moisture than of drying out wood containing only 20 or 30 per cent., it is recommended for the open-tank process that whenever possible at least partially seasoned wood should be used.

Absorption of Preservative

Wood consists of cells bounded by cell walls composed chiefly of cellulose. As yet all tests made to detect the presence of creosote in cell walls of timber treated with preservative have failed to find it there. If this is the case, then the preservative can only be absorbed into the cellular and inter-cellular spaces of the wood. In the open-tank process impregnation with a preservative is accomplished by heating the air and moisture in the cellular spaces of the wood and then cooling the timber while in a bath of the preservative. A partial vacuum is thus created in the cells, which causes the preservative to be sucked back into the cells. In practice all of the air and water cannot be driven out of the wood by heating, nor can a perfect vacuum be obtained by cooling. The maximum practical absorption, therefore, is always less than the theoretical, but an absorption of 38 lb. of oil per cu.ft., or an efficiency of 83 per cent. based on a theoretical absorption, has been obtained by the open-tank method with loblolly pine.

All parts of a piece of timber are not equally easy of impregnation with preservatives; for instance, sap wood can almost always be much more easily treated than hardwood. This resistance appears to be a problem entirely distinct from the density of the wood and may be due to the lignification of the cell walls, which would be greater in the older cells. It is safe to state that the sap wood of practically any species of timber can be completely impregnated by the open-tank process, but the amount of preservative injected per cubic foot can be varied without affecting the distance of penetration. In other words, a full or empty-cell treatment can be easily obtained. Tests made on loblolly mine props showed a penetration of 3½ in., while the absorption of the creosote varied in amount from 6 to 18 lb. per cu.ft. The amount of absorption is controlled largely by the degree and duration of the heating and cooling periods. If held for a long time in hot oil and then submerged in cool oil until no further cooling takes place, the wood will be thoroughly saturated. If heated in hot oil and then submerged in cool oil for only a short period, the cells of the wood will be only partially filled with the preservative. This alternate heating and cooling of the wood can be carried on until complete impregnation results.

When it is desired to impregnate the timber with an aqueous solution, such as zinc chloride, it is first heated in oil and then submerged in a cold-water solution of that salt. Poles cut from Western yellow pine were treated in this manner in California, and the zinc chloride penetrated to a depth of 4 in. The absorption of dry zinc chloride varied from ½ to 2 lb. per cu.ft. The amount of the absorption was controlled by the strength of the solution and the duration of the hot and cold baths.

The open-tank process of impregnation is well adapted to treating round timbers of any kind, such as stulls and posts, or for dimension timbers such as are used for other purposes about mines, but in this treatment it must be remembered that the heart wood is very hard to treat. It happens that the woods which are at present the most abundant and cheaper are almost always the ones best suited to preservative treatment. In a great many cases these can be more advantageously used than the more expensive varieties. Tests made in Louisiana without pressure on hot long-leaf-pine ties showed that the creosote had penetrated ½ in., which is a good treatment for this class of material.

Cost of Different Sizes of Open-tank Plants

There are at present two general types of open-tank plants in use. In one, the wood is moved during the bath; in the other, the preservative is moved. The former is a simpler type and the one best suited for the treatment of small pieces of timber when a cheap plant is desired and the quantity of timber to be treated is small. These plants can be built for as little as $5. Those commonly used by the Forest Service cost from $35 to $180 each and have a capacity of from 50 to 200 fence posts per day. When heavy, large timbers, such as mine props, poles, etc., are to be treated, it is cheaper to build a more expensive plant and to move the liquid rather than the wood. These plants are largely patterned after the pressure plants, but can be built at a much less cost on account of the lighter material and machinery used in their construction. A plant, including a treatment cylinder 50 ft. long and 6 ft. in diameter, will cost about $8000. Plants of this type consist

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of a horizontal cylinder of ¼-in. steel, with swinging door locked by bolts. A small dome is fitted on the top of the cylinder and connected with a surface condenser, so that the vapors and oil which distil over during the hot bath can either be turned back into the treating cylinder or run to waste. The cylinder is fitted with a track for running the cars in and out, with steam coils for heating the oil, and with thermometers for recording the temperature. One or more closed measuring tanks are built either directly over or to one side of the treating cylinder, so that the preservative can flow by gravity. These tanks are fitted with a gage which shows the absorption of the preservative. A receiving tank is built in a pit so that the oil can run from the treating cylinder into it by gravity. The oil is then pumped back into the measuring or storage tank.

The open-tank process has been developed very recently and as yet many problems remain to be solved, but this is also true of the various pressure processes. In order to solve these problems the Forest Service is erecting in Washington, D. C., a laboratory which will be the most complete of its kind in the world. In it there will be retorts strong enough to permit of experimenting with preservatives when pressures as high as 500 lb. per sq.in. are used.

Precipitation of Gold and Silver by Soluble Sulphides

In answering the discussion of his article, "Some Futures of Silver Ore Treatment in Mexico," W. A. Caldecott (*Journ.* Chem., Met and Min. Soc. of South Africa, July, 1908) describes the following experiment to test the possibility of reprecipitation of gold and silver from working solutions by soluble sulphides. A mixture of oxidized and pyritic gold-silver ores from the El Oro, Pachuca, and Guanajuato districts, Mexico, was used. The analysis of the mixed ore is as follows: Silica, 77.89 per cent.; metallic iron, 0.65; ferric oxide, 3.39; alumina, 5.73; lime, 5.52; magnesia, 1.33; sulphur, 1.61; carbonic acid, 1.97; water (loss on ignition), 2.02; total, 100.11 per cent.

The ore assayed 16.3 dwt. gold per 2000-lb. ton (equal to 27.9 grams per metric ton), and 490 dwt. silver per ton of 2000 lb. (equal to 840 grams per metric ton). The metallic iron shown in the above analysis was separated as such by magnet, and was, no doubt, introduced during fine-crushing on the iron bucking board. Part of the iron reported as oxide was probably combined with sulphur as pyrites.

All experiments were made on ore dry-crushed through a screen of 200 holes per linear inch. Hence the crushed ore was practically slimes from a metallurgical standpoint. By long boiling in strong nitric acid, and then, after washing, in aqua regia, an extraction of 93 per cent. of the gold and 91.4 per cent. of the silver was obtained. Such a treatment would, of course, dissolve any base-metal compounds, as well as the gold and silver, which the preliminary fine-crushing had exposed to the action of these powerful solvents.

To test the possibility, indicated in my original paper, of reprecipitation, by soluble sulphides derived from the ore, of the gold and silver in solution, the following experiment was made: 100 grams of the above finely crushed ore was mixed with 200 c.c. of sodium-cyanide solution titrating 0.05 per cent. KCN and 1 gram lime, and the mixture shaken at intervals for six hours. The pulp was then halved into *a* and *b*. The half *a* had its solution, which contained free cyanide, at once filtered off and assayed. The half *b* was put aside in a small, closed flask, which it almost completely filled, for six weeks and shaken once weekly; at the end of this time the solution, which then contained no free cyanide, was filtered off and assayed. The results are shown in an accompanying table:

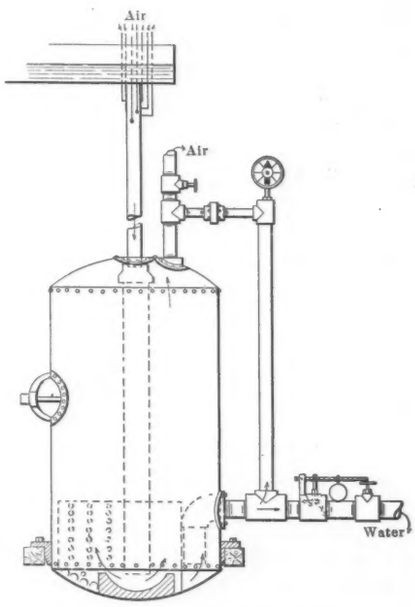
THE RESULTS OF EXPERIMENT ON REPRECIPITATION OF GOLD AND SILVER

Treatment.	Gold Dissolved.			Silver Dissolved.		
	Per Ton of Ore.		Per Cent. Extraction.	Per Ton of Ore.		Per Cent. Extraction.
	Dwt. per 2,000-lb. Ton.	Grams per Metric Ton.		Dwt. per 2,000-lb. Ton.	Grams per Metric Ton.	
a, 6-hours' treatment.	10.00	17.1	61.3	155	266	31.6
b, after 6 weeks.....	0.50	0.9	3.1	21	36	4.3

This showed that very serious reprecipitation takes place under these extreme conditions involving destruction of all free cyanide present, but a similar test with 0.25 per cent. solution showed practically no reprecipitation after 66-hours' contact, when the residual free cyanide strength was 0.21 per cent. The possibility, however, of reprecipitation under certain conditions may partly serve to explain why such short and imperfect settlement in decantation slime treatment is practiced in Mexico, if experience there has shown that prolonged and undisturbed contact between slimes and solution results at times in higher residual values through reprecipitation. Tests of a week's contact of ore submerged in cyanide solution and only shaken once daily gave poor results, so that favorable conditions rather than prolonged treatment seem to be the essential requisite. In general, there would appear to exist the opposing influences of solution, aided by the aëration due to agitation; and of precipitation of dissolved gold and silver favored by absence of oxygen and destruction of free cyanide. A similar condition has been noted in regard to gold precipitated on zinc shavings in contact with cyanide solution.[1] The practical conclusion appears to be that separation of solution from solids should be prompt after the gold and silver is dissolved.

Blakney Hydraulic Air Compressor

Blakney's hydraulic air compressor has been designed to furnish a cheap means of compressing air at mines at which a high head of water is available. It works on the principle of hydraulic compression that has been used in several large installations, but, while the others are in use where there is a moderate head and a shaft is sunk to get the necessary pressure for compression, this machine is designed to be connected to the pressure pipe, using part of the head to obtain the compression. The degree of compression is regulated by a weighted valve. The escaping water can be used for running an impulse wheel for driving other machinery.



BLAKNEY AIR COMPRESSOR

According to the inventor's experiments with a head of 184 ft., the water will furnish by means of this machine 1 h.p. in compressed air at 100 lb. per sq.in. for each square inch of cross-section in the feed pipe. This device is the invention of R. I. Blakney, 4123 Fremont avenue, Seattle, Wash. As yet none of these compressors is in operation.

[1] *Proceedings* of Chem., Met. and Min. Soc., of South Africa, Vol. II, July, 1899, p. 746.

Notes on Cyanidation*

By Leo D. Bishop†

Most ores that are amenable to the cyanide process contain both free and latent acids; these destroy cyanide. Consequently, a protective alkalinity must be maintained to prevent the consumption of cyanide. Alkalies must also be used for the purpose of hastening the filtration of solutions, especially where there is any appreciable amount of slime or finely ground ore.

For the purpose of settling slime it is not necessary that an alkali or hydroxide be used. More effective settlement can be had by the use of distilled water than by the use of either acid solution or hydroxides. Sodium hydroxide produces a coagulation of the slime and a rapid and compact settlement, but leaves a poorer clarification than lime. However, when properly slacked lime is added to the slime, a flocculent effect is obtained and the slime coagulates into a flaky curd that does not settle out so compactly by gravity, but does leave a clearer and more brilliant solution than either sodium hydroxides or acids give.

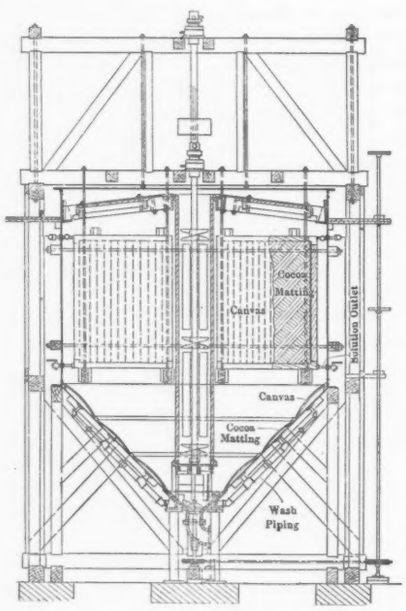
It is not necessary for the purpose of settlement that the slime be coagulated. In fact, it is oftentimes injurious to add lime for that purpose. It is necessary, however, that lime be used and the slime coagulated for the purpose of rapid and clean filtration. In fact it is almost an absolute condition precedent that every particle of slime be completely coagulated in order to get the most rapid filtration and a clear solution suitable for good precipitation.

Experiments to Determine the Effect of Temperature and Excess of Alkali Upon Settling

For the purpose of illustrating the factors governing the coagulation of slime by means of lime, I have carried out some experiments using varying degrees of heat in filtration and varying amounts of lime excess. I have also made some further experiments in the care and slacking of lime, which I shall take up later. For the purpose of these experiments, I took a sample of ore furnished by the Creston Colorado company of Minas Prietas, Sonora, Mexico, which was completely oxidized and silicious in character, containing a high percentage of original slime. This ore was ground in a tube mill until it all passed a 200-mesh screen.

The following experiments were made on pulp containing 2 of solution to 1 of ore by weight: The first sample of slime was allowed to settle one hour when 18 per cent. of partly clear solution was obtained at a temperature of 70 deg. F. Only the natural salts of the ore were in this solution, which was acid in reaction. To the second sample of slime a solution of properly slacked lime was added making 2 of solution and 1 of ore by weight, with the solution carrying 1½ lb. excess lime per ton. After thorough mixing, the sample settled and gave 10 per cent. clear solution in one hour. This is only a little more than half the amount that water gave.

In the next series of tests the purpose was to find out what effect varying degrees of heat would have on the settlement of slime. In these the same Creston Colorado slime was used with a pulp consistency of 2 of solution to 1 of ore in weight. The excess of lime in each case was ½ lb. per ton of solution.



HENDRYX AGITATOR-FILTER USED IN TESTS

In the first sample 18 per cent. of the volume had settled clear in one hour at a temperature of 70 deg. F.; in the second, 24 per cent. of the volume had settled completely in one hour with a temperature at 90 deg. F., and in the third with the temperature at 120 deg. F., 30 per cent. had cleared up in one hour.

Conclusive experiments from freezing to boiling points have not been carried out, but I would expect little, if any, settling at freezing point, and the maximum settling of the slime as the boiling point was approached.

In the next series of experiments to determine the effect of a large excess of lime on settling, the same character of ore was used with all the conditions the same as in the preceding series, except that the excess of lime was raised from ½ to 1½ lb. per ton of solution.

The first sample settled only 10 per cent. of its volume in one hour with the temperature at 70 deg. F.; the second sample settled 12 per cent. of the total volume at 90 deg. F. in one hour, and the third sample 18 per cent. of the volume at 120 deg. F. in one hour.

These experiments indicate that a large excess of lime hinders the settling of the slime, while an increase of temperature greatly aids settlement.

The next series of tests was made to see what effect heat would have on the filtration of slime, using a filter cell of the Hendryx type. This cell is composed of an open frame, with a canvas covering and a layer of cocoa matting between the two canvas sides. Vacuum was not used in these tests, gravity alone sufficing.

In the three tests, the excess lime was ½ lb. per ton of solution and the pulp was 2 of solution to 1 of ore by weight. The amount of pulp used in each test was the same, with all conditions identical except a variation in temperature. At 70 deg. F. the solution filtered at the rate of 8¼ lb. of solution per hour per square foot of canvas per hour. At 90 deg. F., or a raise of 20 deg., the rate was more than doubled, the flow of solution reaching 18 lb. per square foot of canvas per hour, and at 110 deg. F. filtration was made at the rate of 24¾ lb. per hour per square foot of canvas. In other words, with the temperature increased 40 deg., the rate of filtration was increased just three times.

Proper Alkalinity, Choice and Care of Lime

In the next part of this paper I shall deal with the selection of the proper alkalinity, the choice of lime and the necessary care in the handling and use of lime.

The question as to the most economical and satisfactory neutralizer must depend almost entirely on the ore which is being treated. Only by making comparative tests as to the percentage of extraction, the consumption of cyanide and the cost per ton of ore for neutralization can this be determined intelligently. Moreover, the effectiveness of precipitation is also too often influenced by the character and quantity of lime used.

Some ores show an appreciable advantage in extraction, by using sodium hydroxide in conjunction with lime, thereby obtaining an increased extraction and a less consumption of cyanide. A sample of ore from Black Hawk, Colo., gave an extraction of 71.9 per cent., with a loss of 4.1 lb. cyanide per ton, using both lime and sodium hydroxide as neutralizers. Where lime alone was used, the extraction was lowered to 59.7 per cent., and the consumption of cyanide increased to 6 lb. per ton of ore. In this case, the use of 1.5 lb. sodium hydroxide per ton of ore raised the extraction 12 per cent. and lowered the loss of cyanide 1.9 lb. per ton of ore.

*Abstract of paper read before Colo. Scient. Soc., Nov. 7, 1908.

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In the choice of lime and the necessary care in its handling and use there seems to be an almost utter disregard. Rarely any thought is given to the choice of the lime. Many operators class all lime as good lime and let it go at that. In one mill that I have in mind, where a large tonnage of ore was treated it was discovered that fully 33 per cent. of the consumption of cyanide was due to the impurities and cyanicides in the burned lime itself.

The cost of treating ore by the cyanide process is increased probably more by the unintelligent handling and use of lime than by any other item. Many operators today allow their lime to become partially air slacked before using it. After standing exposed to moisture and air, it is then fed in with the ore and drowned with an excess of cold solution.

For purpose of illustration I have taken a Missouri lime, thoroughly calcined. The first sample of this lime was exposed to the air until it became partially air slacked. Then 0.25 lb. was boiled with 1 lb. of water for five minutes; after that the soluble calcium hydroxide was washed out by decantation with a large excess of cold water. The residue after drying amounted to 12.5 per cent.

Another sample of 0.25 lb. of the same partially air-slacked lime with 10 lb. of water at 65 deg. F. was allowed to stand for three days with occasional stirring. The soluble calcium hydroxide was then washed out with an excess of cold water. After drying, the residue amounted to 35 per cent. of the original amount.

The conclusion arrived at from these two tests shows that fully 35 per cent. of the weight of the lime is lost by allowing it to become partially air slacked and then attempting to slack the balance by means of a large excess of cold water.

For the purpose of comparison the next tests were made on lump lime ground to pass a ⅛-in. hole. In the first case 0.25 lb. of lime was placed in 20 lb. of water at 65 deg. F. and allowed to stand for three days with occasional stirring. The soluble hydrate was then removed with an excess of cold water and the residue dried. This residue amounted to 25 per cent. of the whole amount.

In the second case 0.25 lb. of crushed lump lime was mixed with 1 lb. of water. In four minutes the whole mass had reached the boiling point, due to chemical action, and had become almost thoroughly converted from the oxide to the hydrate. There were no lumps or grains left unslacked. The chemical action was practically complete, and a rich, thick paste was the result.

Settlement and filtration tests were then made on the limewater taken from the partially air-slacked lime, the cold-water slacked, and the hot-water slacked. The pulp in each case was 3 of solution to 1 of ore, and the temperature was 70 deg. F. The partially air-slacked lime caused the slime to settle 115 c.c. in a 500-c.c. cylinder, or 23 per cent. in one-half hour. The same solution filtered at the rate of 22 lb. of solution per square foot of canvas per hour in a Hendryx filter by means of gravity.

The cold, water-slacked lime produced a settlement of the slime of 190 c.c. in a 500-c.c. cylinder, or 38 per cent. in one-half hour and a filtration of 23.3 lb. of solution per square foot of canvas per hour in a Hendryx filter by means of gravity.

The hot, water-slacked lime caused the slime to settle 215 c.c. in a 500-c.c. cylinder, or 43 per cent. of the whole volume in one-half hour and filtered at the rate of 23.75 lb. of solution per square foot of canvas per hour. The properly treated lime caused the solids to settle almost double the amount that the air-slacked does, and also to filter somewhat faster.

From the foregoing results the question of the proper coagulation of the slime by means of calcium hydroxide is very important when we come to either the settlement or filtration of ores. Moreover, the application of heat is beyond a doubt economical and beneficial.

The Effect of Heat and Motion on the Solution of Gold

In the second part of this paper, I shall take up the effect of heat and motion on the dissolution of gold from ores. Quite a complete line of experiments was carried out by T. H. Plunkett, of Toronto, Canada, on the rate of dissolution of particles of gold ranging from 70 to 800 mg. in weight, by means of percolation, agitation, and agitation and heat. A particle of gold weighing 70 mg. was dissolved completely in 72 hours by percolation. A particle of the same size was dissolved in 16 hours by agitation and another of similar size in 10 hours by means of agitation and heat. However, such sized particles of gold would not reach the cyanide tanks in practice, but would be caught by amalgamation at the start.

It has been a common belief among cyanide men that the richer the ore, the longer the time of treatment necessary. Perhaps this is true in the usual methods of percolation, but if the pulp is thoroughly agitated, it is not necessarily true, as the following tests show:

A sample of white quartz with all the gold free that assayed $2500 gold per ton, was pulverized to 200 mesh, and the coarse gold removed by amalgamation. The tailings after amalgamation assayed $725 per ton. With an excess cyanide strength of 0.75 lb. per ton of solution and constant and thorough agitation for a period of only nine hours, the tailings were reduced to $1.60 per ton. These results are not difficult to explain when we consider the fact that all the particles of gold remaining after amalgamation were exceedingly small and not any larger than if the ore had assayed only $25 instead of $725 per ton; the cyanide solution was dissolving each and every particle of fine gold during the period of nine hours.

Another advantage of quick treatment is clearly shown in a test made on some 20-mesh tailings from the Ajax mine in New Mexico. These tailings contained a small percentage of iron sulphides. When this ore went into the leaching tanks it assayed approximately $28 gold per ton. After being percolated for six weeks only $1 per ton of ore was recovered. A sample of tailings from the top of the tanks was taken which went $18.40 per ton. Without regrinding, this sample was agitated in a Hendryx agitator for a period of eight hours. The tailings then went $9.60, representing a saving of 47.8 per cent. of the value of the tailings after six-weeks leaching. Another sample was then reground to 150 mesh and readily yielded 93.4 per cent. after an agitation lasting four hours.

The fact that the gold had not been recovered by percolation was accounted for by several different reasons, until an examination and an assay of each foot of tailings in the leaching tanks had been made. It was then discovered that the gold had re-precipitated. The assays showed an increase of value ranging from the top of the tank to the bottom.

Moreover, quick treatment by means of agitation effects a considerable saving in cyanide consumption, especially where there is a considerable amount of sulphides. A lot of ore furnished by the Star of the East Gold Mining Company, consisting chiefly of iron sulphides gave an almost complete extraction at 100 mesh in six hours by means of agitation and heat (90 deg. F.), with a loss of 1.35 lb. cyanide per ton of ore. This same ore yields a somewhat less extraction when percolated for six days, and the consumption of cyanide ranged from 0.50 to 0.75 lb. for each succeeding day after the first. The continual decomposition of the sulphides will and does produce a loss of chemicals, varying with the time of treatment.

Effect of Viscosity on Settling

In discussing Mr. Bishop's paper, Charles W. Comstock said that the increased rapidity of settling at the higher temperatures might be explained by the decrease in viscosity of the water with increase of temperature. If this is the true cause, the observed volumes of clear solution in Mr. Bishop's experiments should be nearly inversely as the coefficients of viscosity at the temperatures of the observations. The coefficients of viscosity deduced from the experiments of Poiseuille, and expressed in dynes per square centimeter, are given in the following table:

TABLE I.

Temp. in Deg. Centigrade.	Coefficient of Viscosity, N.
0	0.01723
10	0.01268
20	0.00978
32	0.00748
50	0.00532
70	0.00388

Mr. Bishop's experiments were made at temperatures of 70 deg., 90 deg. and 120 deg. F. I have used 20 deg., 32 deg. and 50 deg. C. as nearly equivalent, and have tabulated below the results of his observations together with the reciprocals of the coefficients of viscosity, giving also the relative values with the results at 20 deg. C. as unity:

TABLE II.

Temperature, Degrees Centigrade.	$\frac{1}{N}$		Percentage of Clear Solution.			
			0.50 Lb. Excess Lime.		1.50 Lb. Excess Lime.	
	Actual.	Relative.	Actual.	Relative.	Actual.	Relative.
20	102.2	1.000	18	1.000	10	1.000
32	133.7	1.308	24	1.333	12	1.200
50	188.0	1.840	30	1.667	18	1.800

It will be noticed that the agreement between the reciprocals of the coefficients of viscosity and the observed speeds of settling is sufficiently close to justify the inference that the whole effect of the increase in temperature is the decrease in viscosity. There are, of course, some irregularities which call for explanation. It is known that, other conditions remaining the same, the solution of certain salts, notably potassium sulphocyanate and potassium chloride, decreases the viscosity of the solution below that of pure water, while the solution of salts of other metals (excepting only rubidium and cæsium, which do not occur in sufficient quantities to be worthy of consideration in this connection) increases the viscosity of the solution. A change in the temperature may change the relative amounts of potassium and other salts in the solution and thus produce an increase or a decrease in viscosity which must be superposed on the change due directly to temperature. This would appear to be a sufficient explanation of the irregularities in Table II.

Antimony Mines of Italy

Antimony ores are found in many parts of Italy, in addition to the better known locality at Limina, near Messina, in Sicily. There are important mines in Tuscany, where the Cettine di Cotorniano operates in a massive deposit of stibnite in Triassic dolomite; the Pietratonda and Casale di Pare mines at Campagnatico find the stibnite mixed with a chalcedonic gangue extending through Eocene limestones.

Each of these three Tuscan mines has its smeltery. The one at the Pietratonda mine consists of four furnaces for making oxide, and two reverberatory furnaces for reducing the oxide to metal. This plant went into operation in 1906 and is capable of yielding 2000 tons of antimony per year. The ore is easy to treat, since it contains nothing but stibnite and quartz.

At Casale di Pare, the silicious gangue rock is fissured, so that subterranean water has altered the stibnite into oxides and oxysulphides, with stibnite remaining intact only in the denser zones. The smeltery at this mine has three oxide furnaces, with reverberatories for reducing to metal.

According to *l'Echo des Mines* the old process of burning the ore and liquating the stibnite was not found satisfactory with these Tuscan ores, which carry only about 12 per cent. of antimony, but the present method, which consists of smelting the ore with coke in a furnace with abundant air blast and settling the oxides in a series of chambers, works satisfactorily. The difficulty at Casale di Pare is the presence of the oxides, which are fusible at only high temperatures, requiring special means to insure the necessary amount of air blast.

In Sardinia there is a mine at Carcinargius, now connected with the port of Corallo by a new 5-km. road, and another mine operating its own furnaces at Suergiu.

The Premier Diamond Mine

Special Correspondence

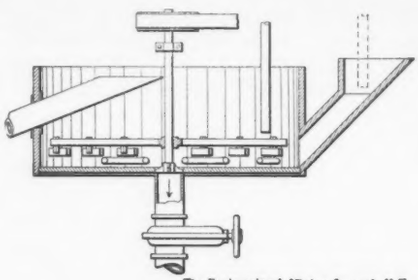
The production of the Premier Diamond mine in the Transvaal for the year ended Oct. 31, 1908, amounted to 2,078,825 carats, an increase of 188,838 carats over the previous year. The number of loads of dirt washed was 8,058,844. The yield per load was 0.258 carat. The value of the diamonds recovered was £1,536,719, equal to a value per carat of 14s. 9d., and a value per load of 3s. 9d. The cost of production per load washed was 1s. 10d.

The directors report the termination of the contract with the Diamond Syndicate, which disposes of the De Beers output, and the opening of offices in London for the sale of the Premier stones. The sales have so far been satisfactory, and the directors say that they look upon the future of the trade as reassuring and that, while the market has not as yet been restored to its former buoyancy, they anticipate a fair demand during the current year. The prices realized by the company are on an average lower than heretofore, a result not entirely due to lower markets, but partly to a slight deterioration in the quality of the finds. The company states that it will not attempt, any more than it has in the past, to increase sales by lowering prices, but to maintain a policy of working on a scale commensurate with the size and capacity of the mine. At the general meeting of the company, held in February, no secret was made of the determination of the directors to fight De Beers.

By diamond buyers the news that the monopoly has broken down will be welcomed, although those with stocks on hand cannot fail to be alarmed at the possibility of a heavy fall in the price of the stones, which the uncontrolled production may bring about.

The Sanders Flotation Process

In U. S. Patent 911,077, Feb. 2, 1909, Walter M. Sanders describes an apparatus for his flotation process. It consists of a tank, preferably of cylindrical form, with a feed hopper leading below the normal



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SANDERS FLOTATION APPARATUS

liquid surface. A solution inlet pipe is placed either in the tank or in the hopper, depending on the ore to be treated. A vertical shaft in the center of the tank rotates an agitator, the blades of which are arranged to impart a whirling motion to the solution. This whirling motion is designed to assist in raising the valuable mineral particles to the center of the tank and to cause a slight cavitation at the center of the surface, which causes the particles which have been elevated to pass at once to the overflow pipe. The tailings are discharged through a pipe in the center of the tank's bottom. A steam pipe is used on the bottom of the tank to keep the solution at an even temperature.

The Electric Smelting Company will install at Ludvika, Sweden, two furnaces for smelting iron by electricity and two for making steel, of the type designed by Dr. Eugene Haanel, of the Mines Department, of Canada.

The Coal-mining Industry of Montana

A Review of Each Property with Scale of Day Wages and Schedule of Mining Rates. Each Pound of Powder Produced 2.81 Tons of Coal

BY J. P. ROWE*

The coal industry of Montana for the year just past has been important from several standpoints. During 1908 the United States Geological Survey has had several parties in the field in eastern and northern Montana working in the purely lignite beds of these sections of the State. Several new mines have been opened, including the new West Side or Sunset mine at Red Lodge; the Chicago, Milwaukee and Puget Sound property, or Republic Coal Company, at Roundup, was greatly improved and developed; the Amalgamated plant, at Belt, closed their coke ovens; the Amalgamated property at Storrs, was practically idle during the entire year. In the realm of labor an agreement was entered into between the mine owners and unions until October, 1910. Carbon county is now the leading county in the State in the production of coal, with Cascade a close second.

In discussing the coal industry in this paper the counties will be taken in alphabetical order, and also the same order for the companies operating in each county.

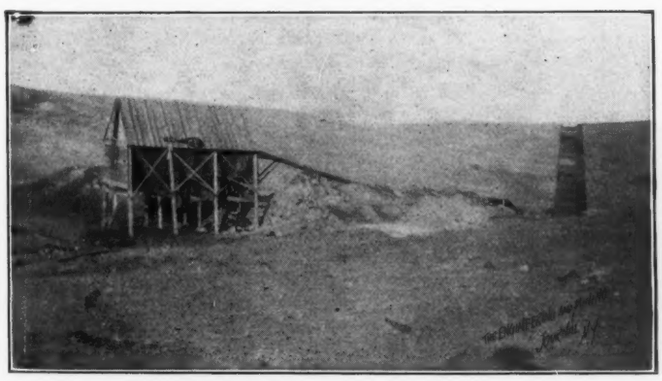
Carbon County

The Barrett Brothers mine, located near Joliet, with Thomas Barrett, manager, operated 108 days with three pick miners, and produced for shipment 471 tons of coal, and sold to local trade and employees 502 tons. This mine has good promise, but during the past year nothing but development work was done. The Bear Creek Coal Company, located at Bear Creek, and managed by H. S. Hopka, worked 177 days, employing 72 pick miners, 7 inside and 15 outside day-hands, 1 machineman, 34 unloaders, producing for shipment 71,099 tons of coal, and sold to local trade and employees 520 tons; also using at the mine 1814 tons. This property is fast pushing the development work, and during the past year installed a 150-kilowatt electric generator and one 8-ton motor for haulage. The company is now working two seams, Nos. 2 and 3. No. 2 seam developed the first serious fire, by spontaneous combustion, in the Bear Creek field. All of the Bear Creek mines are dry, and a fire by spontaneous combustion is feared at many of the other properties. The fire in the Bear Creek mine is still alive but is not doing much damage. The coal is being undermined by means of mining machines, of the electric-cutting bar type, and consequently much dust is produced.

The Bituminous Coal and Coke Company's operation is located at Coalville, and is managed by Willis Todd. During

INTERIOR OF LIGNITE MINE AT MILES CITY

COAL OUTCROP ON YELLOWSTONE RIVER



TIPPLE AND MINE OPENING NEAR HAVRE, MONTANA

COKE AND COKE OVENS AT ELECTRIC, MONTANA

the past year 60 pick miners, 28 inside and 24 outside day-hands were employed, working 209 days and producing for shipment 21,689 tons of coal. This property is driving a double-entry system and recently installed an electric fan which has proved unsatisfactory. The mine will soon be lighted by electric lights and other important improvements will be installed within the next 12 months.

The Bridger Coal and Improvement Company, of Bridger, is managed by George Hough, and is one of the oldest mines in Carbon county. This mine was worked 200 days during the past year, employing 40 pick miners, 20 inside and 20 outside day-men, and produced for shipment 25,425 tons of coal, and sold to local trade and employees 2293 tons, besides using 5334 tons at the mine. This plant outside was practically rebuilt, new machinery was installed and work was commenced in sinking a new slope. This mine and the Spring Creek Coal Company, at Lewistown, are the only mines in the State operated by the longwall method.

The International Coal Company, of Bear Creek, managed by H. Rosetti, operated its mine 171 days during the past year, with 78 pick miners, 9 inside and 19 outside day-men, and produced 23,490 tons of coal for shipment, and sold to local trade and wasted stock coal to the amount of 4010 tons. No. 3 seam was developed during the past year and is worked by means of an inclined plane from No. 3 bed to another landing, and from this landing the coal is run to the tipple by means of another inclined plane. This mine, in every way, is in splendid condition.

The Kilborn and Weber property, at Fromberg, managed by George Kilborn, employs 17 miners, 2 inside and 2 outside day-men, and during the year 1908 produced in all over 12,000 tons of coal. The mine is now ventilated by means of a furnace, but a fan ventilator will be installed some time during the year 1909. During the past year the slope was sunk deeper, a new boiler and new hoisting engine was installed, and bunkers large enough to handle all of their production were built.

The Montana Coal and Iron Company's plant is situated at Bear Creek, and is managed by W. W. Worthington. The company employs 16 pick miners, 5 inside and 4 outside day-men, and produced, during 1908, 21,810 tons of coal for shipment, and sold to local trade and employees 144 tons. This company installed a box-car loader, an electric fan for ventilating purposes, and made several interior changes during the past year. The mine is in good condition and the company is making preparations for a large output for the coming year.

The Northwest Improvement Company, of Red Lodge, the largest producer in the State, is now operating two properties at Red Lodge, which are managed by C. C. Anderson. The West Side, or Sunset mine, is the new property, and the main entry or slope is driven in the No. 1½ seam. As yet no great amount of coal is being mined from this mine, but development work in the shape of opening up entries, driving rock tunnels from one seam to another, etc., is being pushed. The mine, however, is being opened with a view to permanency. The slopes, airways, and manways are all being well made, and all timbering and drainage arrangements are being constructed with a view to the concentration of work. The East Side, or old mine, is now working seams Nos. 1½, 2, 4, 5 and 6. The coal mined from these beds is hauled through and out of the entryways or slopes of seams Nos. 1½, 2 and 4. From these entryways all of the coal is dumped over the one dump or tipple.

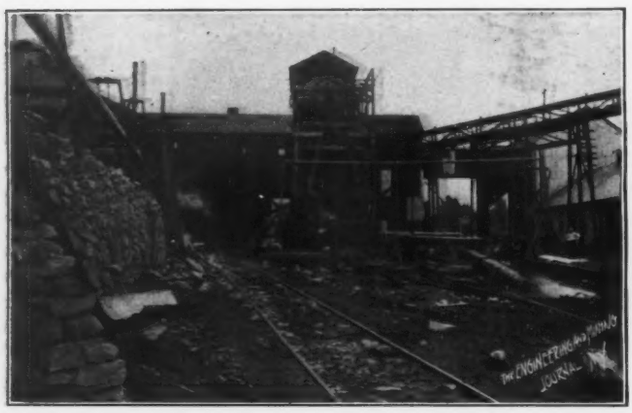
During the year just closed, there was reported a production for shipment of 550,527 tons of coal, sold to local trade and employees 11,272 tons, and used at the mines 40,534 tons, or a total output for the year of 602,333 tons. The number of men employed is as follows: 520 pick miners, 193 inside and 150 outside day-men, or a total of 863 men, over 25 per cent. of all of the men employed in the coal-mining industry of Montana. The number of days this mine was worked last year was 273.

The West Side, or Sunset mine worked 166 days, with 60 pick miners, 40 inside and 51 outside day-men, 1 machineman, and produced for shipment 32,343 tons of coal, besides 11,900 tons which were sold to local trade and used at the mine.

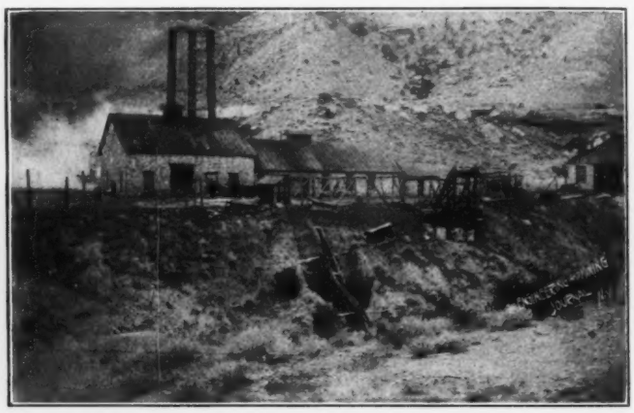
Under former management the old mine at Red Lodge was mined with the sole purpose of showing a big output, regardless of the amount of coal left remaining in the territory mined; therefore, most of the large coal pillars were allowed to remain untouched. The present management is now pulling these pillars, especially in the fifth east, and it is quite dangerous work. No. 4 slope has been driven by the present management to the seventh level east and fifth level west. Entries have been driven and rooms turned off of these contribute a considerable portion of the coal produced in the east side property. The sixth level east was pushed both ways from a slope driven from about room 52, fifth east entry, and the ventilation current is returned from the sixth east through the fifth east. There is more or less gas given off in the fifth west and seventh east, and several explosions have occurred, resulting in a number of men being burned. In general, the mines of this company are in good condition, and a large output is being planned for 1909.

The Smokeless and Sootless Coal Company, of Bear Creek, is managed by James Brophy, who reports having operated the mine 240 days with 10 pick miners, 5 inside and 5 outside day-men, producing for shipment 6349 tons of coal. The mine was idle 30 days on account of a strike and 30 days on account of car shortage. The company made many improvements during 1908, such as a new tipple, put in new scales, made better roads, better dwellings for the miners, and put in a new power plant and water supply.

The Washoe Copper Company, at



TIPPLE AND NEW SPIRAL SEPARATORS, RED LODGE, MONTANA

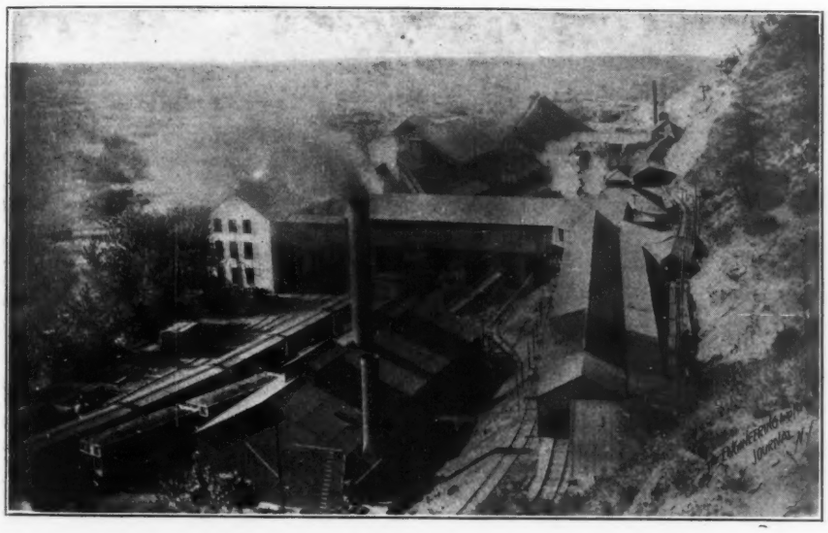


PART OF THE BEAR CREEK COAL COMPANY'S RECENT IMPROVEMENTS

Washoe, managed by F. W. C. Whyte, of Anaconda, operated their mine 187 days during the year, employed 90 pick miners, 27 inside and 18 outside day-men, and loaded for shipment and sold to local trade and employees 72,862 tons. Improvements in the shape of track scales, fan, tipple and box-car loader were installed during the year just closed. The company has completed a rock slope through Nos. 1 and 2 seams, and a large output is expected during 1909.

Cascade County

The Amalgamated Copper Company, operating coal mines at Belt, is managed by F. W. C. Whyte, of Anaconda, and until recently made most of the coal mined into coke. This company reports working the mine 243 days during 1908, and employed 37 pick miners, 90 inside and 55 outside day-men, 34 machinemen, and 77 loaders. The amount of coal mined during the year was 186,287 short tons. Owing to the June floods this property was idle almost the entire month.



NORTHERN PACIFIC PLANT AT RED LODGE, MONTANA

The Cottonwood Coal Company, at Stockett, is the largest single producer in Cascade county, and the second largest single producer in the State. This property is managed by James Pearson and during 1908 the mine was worked 204.5 days. The number of men employed is 98 inside, and 111 outside day hands, 106 machinemen, and 148 loaders. The output for the year was 421,013 tons for shipment, sold to local trade and employees 2463 tons and used at the mines 9690 tons.

Everything is first class in this mine and it is remarkable that with the number of men employed by this company, not one fatal or serious accident happened during the past twelve months. The system in vogue in this property is classified labor. The machinemen undermine the coal, which is done with puncher mining machines; these machinemen are followed by another set of men who drill the holes necessary for blasting down the coal—this is done by means of air drills; another set, or shooters, are employed to charge the holes and tamp and shoot down the coal; a lumberman is employed to keep secure a certain number of places; a tracklayer to keep the road laid up in his allotted number of places; and loaders are employed to separate the refuse from the coal and load it out. Practically the only improvement done at this property for the past year was the extension of the rope-haulage system on the north side of the mine.

The Louis Dahn mine is a small property at Sand Coulee. The mine was worked 100 days with 6 pick miners, 1 inside and 2 outside day hands, and produced about 4000 tons of coal. The Gerber Coal Company is located at Sand Coulee and is managed by Ed. Gerber. This property was worked 171 days during the year, employing 11 pick miners, 12 inside and 10 outside day hands, with 6 machinemen and 8 loaders. The mine yielded 26,269 tons of coal for shipment and 2863 tons were sold to local trade and used at the mine. This latter mine is in fairly good shape regarding ventilation, timbering and drainage in the working places. No special improvements were made during the past year.

The Lakeside Coal Company, managed by R. W. Wilson, has just begun operations in the property formerly worked by the Sand Coulee Coal Company. The present company has drained some of the workings of water by means of a tunnel. Ten pick miners, and 1 inside and 2 outside day-hands are at present employed at the mine. Much is expected of this propperty during 1909. A new tipple has just been finished and many other minor improvements have been made. The Nelson-Jenks Coal Company, at Sand Coulee, is managed by John Pierce, and was operated 196 days during the past year. The company employs 50 pick miners, 50 inside and 15 outside day-hands; 15 machine-men and 50 loaders. The mine produced 111,178 tons of coal for shipment, sold 597 tons to local trade and employees, and used 1837 tons at the mine. A small mine fire was found in this mine during the past season. In general, conditions are good at this property.

The Fred Schmauch mine, or the old Lewis mine, at Belt, is managed by Frank Calone, and is one of the small producers of Cascade county. The property was worked 290 days, employing 6 pick miners, 2 inside and 1 outside day-men and produced 2485 tons of coal for shipment, also 2583 tons for local trade. The only improvements for the past year were new chutes for loading the coal. There are many minor properties in this county producing from 200 to 2000 tons of coal annually, but as most of them are merely holes in the ground, they can hardly be considered as mines.

Choteau County

The Havre Coal Company, near Havre, is managed by F. F. Bossnot. This mine was worked 250 days, employing 10 pick miners, 2 inside and 2 outside day men, and produced for shipment 3067 tons of coal and sold to local trade and employees 5113 tons. This mine is the largest producer in Choteau county, and furnishes all of the fuel for Havre, a thriving little city, and the surrounding country.

The Macton Coal Company, of Big Sandy, is managed by F. F. Thompson, and worked 154 days during 1908, producing 2422 tons of coal. Many improvements were made during the past year, such as new scales, a new tipple, making roads, building dwellings for the miners, installing a water system and power plant. This mine will, without doubt, be a large producer during 1909.

The Milk River Coal Company, of Chinook, is another fair producer of lignite in Choteau county, and during 1908, the mine was worked 150 days, with 8 pick miners, 2 inside and 2 outside daymen, producing 3740 tons of coal. There are several other small producers in Choteau county, but as most of them simply supply the neighborhood with fuel, no mention of them is made.

Fergus County

The Spring Creek Coal Company, of Lewistown, is the largest property in this county. R. W. Stone is manager and the mine was worked 270 days during 1908. The mine has increased in size to a considerable degree during the past year or so, and the company now employs 70 pick

miners, 17 inside, and 13 outside day-men, and 2 machinemen. The mine produced 38,318 tons of coal for shipment in 1908. The improvements made during the past year are as follows: New boiler and boiler-house; new wash-house and escapement shaft (this latter was sadly needed). The only opening to the surface was surrounded with buildings that would have caused trouble to the mine in case of fire.

The Spring Creek mine is the second property in the State to be worked by the longwall method, and at the present writing, this method is successful. There are many other mines now in operation in Fergus county, but none are large producers.

Gallatin County

The Northwestern Improvement Company, at Chestnut, managed by C. C. Anderson, of Red Lodge, with Mr. Forsyth as resident superintendent, worked but 75 days with full force during the past year. This mine has been one of the chief sources of coal for the Northern Pacific locomotives for the past few years. It has never been, however, a paying proposition. Besides working 75 days with 106 miners, 24 inside and 24 outside day-men, as full force; 225 days were put in with 3 miners, 4 inside and 13 outside day-men. The total production for the year was 25,653 tons. Many new improvements were made during the year, such as sinking the main slope and airway 425 ft. below the second level, and the installation of a new electric pump.

Park County

The Anderson and Evans property, located at Chimney Rock, is managed by John Anderson, and is one of the best mines in the Trail Creek field. The mine was worked, during the past year, 242 days with 33 pick miners, 4 inside and 8 outside day-men, producing in all 21,639 tons of coal. The Maxey mine is located at Chimney Rock and is managed by Wm. Maxey. The mine was worked 211 days with 27 pick miners, 3 inside and 22 outside day-men. The output for the year was 15,250 tons.

The following improvements were made at the Maxey mine during 1908: The opening of a new pair of entries on the surface to split a block of coal between the old mine and the one on the incline. The tipple remodeled and new revolving screens installed. A new system of water works was completed and several good houses for miners and their families were built.

The Montana Coal Company, of Electric, is now the only mine in the State that has its coal coked. The property is situated at the extreme southern part of the State, near the Yellowstone Park, and the coal beds have been greatly metamorphosed. Edward A. Bartl is manager and Wm. Dickinson is chief chemist. During the past year this mine was worked 300 days with 85 pick miners, 114 inside and 109 outside day-men. The production was 65,015 tons of coal which made 29,482 tons of coke. There were built, during 1908, three lines of aërial trams to convey the coal from the mines to the ovens; No. 1 line being 4500 ft. long; No. 2 line, 8000 ft. long, and No. 3 line, 7500 ft. long. Other improvements were made, such as a complete renewal of the power plant; telephone and signal lines were rebuilt; also 5 miles of coal flume were constructed; five boilers set, and one steam and one electric hoist installed. This mine, at Electric, is in good condition and has been working more days than any other mine in the State. The coke ovens are located three or four miles from the mines. All of the coal is fine when mined and is washed before going to the coke ovens.

The Trail Creek Coal and Land Company is located at Chimney Rock and is managed by Hirst Beever. The mine was worked 198 days during the past year with 20 pick miners, eight inside and seven outside day-men, producing in all 5728 tons of coal. No improvments of any importance were made in 1908.

Yellowstone County

The Republic Coal Company, at Roundup, is managed by W. W. Taylor, and is on the main line of the Chicago, Milwaukee and St. Paul railroad. The mine was operated 290 days last year with 36 pick miners, 14 inside and 17 outside day-men. The total output was 39,348 tons. The improvements were a new tipple, new hoist, new boilers, new hoisting engine, new blacksmith and carpenter shop, and side tracks. At present the company is sinking two shafts, one to be used as a hoist and the other as an airway. The mine has considerable water with which to contend, but so far this has been easily handled. A new fan for ventilating purposes is now being installed and everything is being put in shape for a splendid output for 1909.

Coal Production and Powder Used

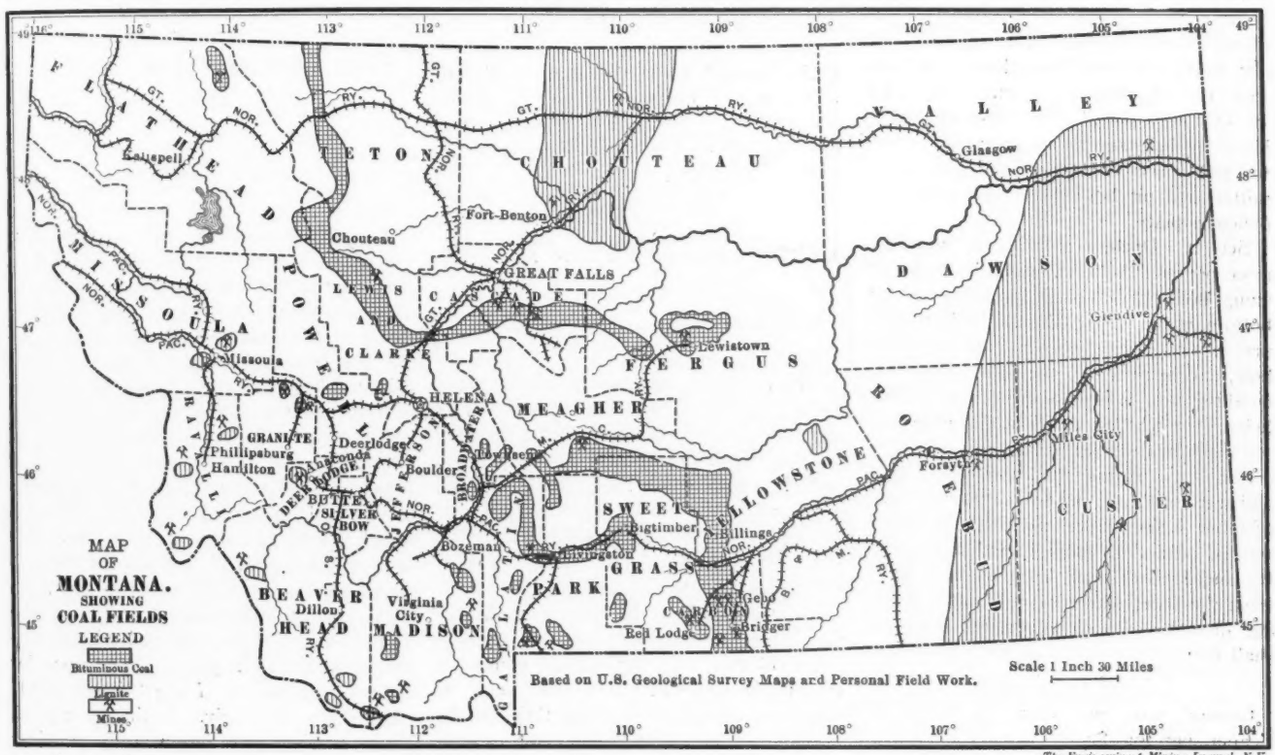
An interesting feature of the Montana coal production to many coal miners and coal-mine operators is the following collected statistics regarding the use of explosives and the amount used per ton in the various coal mines of the State. This data is for the year 1907, but it varies but little for 1908 and other previous years:

Kilborn and Weber, reported production, 16,162 tons; powder used, 25,000 lb., equal to 0.65 ton with 1 lb. of powder. Red Lodge reported 466,860 tons of lump and nut, 245,825 lb. of powder, which would be equal to 1.9 tons with 1 lb. of powder. International Coal Company reports 10,025 tons production, and 1200 lb. of powder used, which is equal to 8.4 tons with 1 lb. of powder.

The Bridger Coal and Improvement Company's production was 54,441 tons, while 15,000 lb. of powder were used; this is equal to 3.6 tons with 1 lb. of powder. Smokeless and Sootless Coal Company reports 5.8 tons of lump to 1 lb. of powder.

PORTAL OF TUNNEL, NELSON BROTHERS MINE AT SAN COULEE, MONTANA

Stockett produced 2.6 tons of coal with 1 lb. powder. Nelson-Jenks Coal Company produced 2 tons coal with 1 lb. of powder. Stainsby-Latham Coal Company shows 2 tons coal with 1 lb. of powder. Ed. Gerber's reports show 3 tons gotten down with 1 lb. of powder. Matthew Richardson, 2 tons with 1 lb. of powder. Anaconda Copper Mining Company, 3 tons of coal with 1 lb. of powder. Frederick Schmauch & Co., 1.5 tons of coal gotten down with 1 lb. of powder. Millard mine, 4 tons with 1 lb. of powder. I will forego publishing a complete list of all the mines in the State, however, my general average for the entire State, not counting the mines that produce coal without the use of powder, is 2.81 tons of coal produced for every 1 lb. of powder used.



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Quality and Cost of Powder Used

The powder used in the coal mines of Montana is generally black blasting powder, running in the grades of F, FF, FFF, etc., and is furnished where the coal is mined with machines by the company. However, pick miners in all parts of the State furnish their own powder.

Black powder costs on an average of $2.40 per keg; giant powder, 20c. per lb. "Three X" caps cost 75c. per 100; "Four X" caps, 80c. per 100; "Five X" caps, $1 per 100. The fuse that is used in many places to fire the blast is 75c. per 100 ft. Most of the blasts are fired by means of fuse. Some miners, however, use needle and squibs.

Scale of Day Wages

The following wage scale has been adopted for the employees of coal mines in Montana by an agreement between the Montana Coal Operators' Association and the United Mine Workers of America, District No. 22, for the year commencing Oct. 1, 1908, and ending Sept. 30, 1909:

"It is definitely understood that this agreement is based on an 8-hour day; an 8-hour day means 8 hours' work at the usual working place, exclusive of ½ hour for mid-shift lunch, 6 days per week, when required by the operators, Sundays and legal holidays excepted.

"However, this does not prohibit engineers, rope-riders and motormen from working the time necessary to hoist and lower men, and in no case shall they work more than 10 hours, but all such hours worked over 8 shall be paid for at the rate of an 8-hour basis."

SCALE OF DAY WAGES, OUTSIDE.

	Per Day.
Engineers, 1st class	$4.00
Engineers, 2d class	3.50
Water tender	3.35
Fan fireman	3.35
Blacksmiths	3.75
Blacksmiths helpers	2.75
Carpenters	3.75
Car repairers	3.50
Car repairer's helpers	2.75
Machinists, 1st class	4.00
Machinists, 2d class	3.50
Coal inspector	3.00
Drill boys, minimum	1.75
Firemen	3.15
Head brakeman	3.15
Other brakemen	2.75
Rope-cutters, when so specially engaged	3.15
Drivers	3.00
Head dumpers	3.00
Teamsters	3.00
Head brakerman	3.75
Other brakermen	2.75
Boys on picking tables, minimum	1.50
Boys on breaker, minimum	1.50
Jigmen	3.25
Other washermen	2.75
Greasers	2.30
Oiler and wiper	3.00
Cokemen	2.75
Timber-framer	3.00
Box-car shoveler	3.00
Larry car operator	2.85
Motormen	3.50
Outside labor, not classified	2.75

	Per Month
Barnman, in charge of more than 15 head stock	95.00
Barnman, in charge of less than 15 head stock	80.00
Assistant barnmen	70.00

SCALE OF DAY WAGES, INSIDE.

	Per Day.
Miners	$3.75
Timbermen	3.75
Timbermen's helpers	3.25
Tracklayers	3.75
Tracklayers' helpers	3.25
Bratticemen	3.75
Shooters or shot-firers	3.75
Machine-runners	3.90
Machine-runners' helpers	3.40
Drillers	3.75
Drillers' helpers	3.25
Machine repairers	4.00
Pipe foremen	3.75
Pipemen	3.25
McGinty repairer, rope splicer	3.75
Drivers	3.60
Motormen	3.50
Inside engineer	3.25
Parting men and connection men	3.25
Rope-riders	3.40
Rope-riders, main rope	3.75
Greasers	2.25
Fan turner—boy	3.25
Boy couplers on partings	2.25
Pulley repairers	3.75
Trappers	1.60
Pick carriers	2.25
Bucker boys	2.35
Barnmen	3.50
Pumpmen	3.75
Inside labor, not classified	3.25

Scale of Mining Rates and Local Provisions
Red Lodge

Mining Rates

Veins Nos. 4 and 5—per ton of 2000 lb. mine-run, 62c. Vein No. 2—per ton of 2000 lb. mine-run, 66c. Veins Nos. 1, 1½ and 6—per ton of 2000 lb. mine-run, 74c. Crosscuts in entries and rooms, $1.60 per yd. Entries driven by hand, $3.25 per yd. Room turning, $10 per room.

Local Provisions

Lump coal delivered to miners, $2.25 per ton. Mine-run coal, delivered to min-

ers, $2 per ton. Washed coal Nos. 1 or 2 delivered to miners, $1.75 per ton. In all pillar work where track is moved or replaced, it shall be classed as shift work. There shall be a board at foot of all entries for the convenience of miners to note material needed at working places. When veins Nos. 5 and 6 are worked together and the intervening rock becomes 6 in. or more in thickness, the local officers and the company officials will fix a rate of compensation, or rock shall be lifted at the day rate.

STOCKETT

Mining Rates

Sec. 1. Machinemen, 2c. per sq.ft.; machine-helpers, 1.75c. per sq.ft., for all places over 12 ft. wide. Machinemen, 3.1c. per sq.ft., and machine-helpers, 2.5c. per sq.ft. for all places 12 ft. wide and under. In deficient places machine-runner and helper to be made up to average day rate for such class of work. The mine committee and pit boss to decide what is a deficient place.

Sec. 2. Drillers working as partners, price per coal hole, 12½c. each; price for sump hole, 32½c. each; price for lifting bottom holes, 32½c. each. Drillers who are working with helpers, 14c. per coal hole, and helpers 11c. per hole. The same conditions to apply to drillers and drill-helpers in making up deficient places as for machinemen and helpers.

Sec. 3. Loading coal, dry work, 24c., and wet work, 25c. per ton of 2000 lb. run-of-mine. No loader shall load coal in rooms, pillars or entries farther than 10 ft., and loaders shall keep all rock 9 ft. from the face; where more than the average quantity of rock exists, the company shall furnish men to clean such places.

Local Provisions

Ground rent, per year, $8. Coal at cleaner, per ton, $2.

SAND COULEE

Mining Rates

Sec. 1. Machinemen, 2c. per sq.ft.; machine-helpers, 1.75c. per sq.ft. for all places over 12 ft. wide. Machinemen, 3.1c. per sq.ft. and machine-helpers, 2.5c. per sq.ft. for all places 12 ft. wide and under. In deficient places, machine-runners and helpers are to be made up to average the day rate for such classes of work. The mine committee and pit boss to decide what is a deficient place.

Sec. 2. Drillers working as partners, price for coal hole, 12½c. each; price for sump hole, 32½c. each; price for lifting bottom holes, 32½c. each; price for lifting bottom holes, 32½c. each; drillers who are working with helpers, 14c. per coal hole, and helper, 11c. per hole. The same conditions apply to drillers and drill-helpers in making up deficient places as for machinemen and machine-helpers.

Sec. 3. Loading coal, dry work, 24c., and wet work, 25c. per ton of 2000 lb. run-of-mine. No loader shall load coal in rooms, pillars, or entries farther than 10 ft., and loaders shall keep all rock 9 ft. from the face; where more than the average quantity of rock exists, the company shall furnish men to clean such places.

Sec. 4. Pick mining, 75c. per ton of 2000 lb. run-of-mine.

Sec. 5. Yardage in entries, $3 per yd.; crosscuts in entries, $3 per yd.; crosscuts between rooms, 12 ft. wide, $1.50 per yd.; room turning, $8.

All places driven over 12 ft. wide and under 18 ft. to be paid at rate of 1.50 per yard.

Local Provisions

Screened coal, per ton delivered, $2.50. Ground rent, per year, $8.

At other mines the scale of mining rates varies according to the local conditions that exist. The foregoing rates, however, are fairly typical of the schedules that exist in all of the other important districts of the State.

Determination of Tin and Antimony

BY EDGAR B. VAN OSDEL*

The following scheme has proved satisfactory in the analysis of alloys such as type metal or of solutions containing only tin and antimony. Arsenic, if present, would naturally be found with tin and antimony when their sulphides are dissolved in ammonium polysulphide. But it can easily be removed by precipitation as ammonium magnesium arsenate.

The solution must be free from all oxidizing agents such as nitric acid, potassium chlorate, etc., and should contain a reasonable excess of hydrochloric acid. If oxidizing agents are present they can be decomposed and removed by boiling with excess of hydrochloric acid. From 15 to 20 grams of iron wire are added and the solution boiled for a sufficient length of time to precipitate all the antimony. If the solution becomes too much concentrated, more water and hydrochloric acid must be added.

When the antimony is all precipitated, the tin will be entirely reduced to stannous chloride. Filter quickly, washing with cold distilled water; the filtrate is now ready for titration with standard iodine. Place the funnel and filter containing the antimony in an Erlenmeyer flask, sprinkle about a gram of potassium chlorate on the precipitated antimony and pour on slowly, enough hydrochloric acid to take it into solution.

Wash with hot water if convenient and add a generous excess of hydrochloric acid. Boil hard until all chlorates are decomposed and no odor of chlorine remains. Add enough cold water to insure that the acid present is less than one-third and allow the whole to become cold. Then add from three to five grams of potassium iodide and titrate immediately; with sodic thiosulphate. Antimonic chloride is reduced to antimonious chloride and iodine liberated and can be titrated with starch indicator.

The main idea of this scheme is from Sutton's Volumetric Analysis and as here developed has given excellent satisfaction. The standard can be obtained from metallic antimony direct or from the copper standard; 126 copper or 120 antimony liberate 254 iodine, hence the copper standard is to the antimony standard as 63 is to 60.

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New Diamond Mines in South Africa

SPECIAL CORRESPONDENCE

Apart from the New Jagersfontein Company, which produces diamonds of a finer average quality than any in South Africa, and which is closely allied to the DeBeers Consolidated, the two most important diamond mines in the Orange River colony are the Voorspoed and the Roberts Victor—both comparatively new discoveries. The latter mine, in spite of the purity of its stones, has proved a great disappointment, but the former is undoubtedly developing into a concern which, owing to its large "pipe" area, will hold a position of significance in the diamond world. It is noteworthy that both these mines, like the Premier in the Transvaal, are being equipped with direct-treatment plants in place of the floors for natural weathering of the "blue ground" employed at Kimberly. At the Voorspoed, Gates crushers are followed by grinding pans—a novel feature—and then ordinary rotary washers, from which the tailings are reground and rewashed. The capacity of the machinery is 8000 loads, of 16 cu.ft. each, in 24 hours. It is difficult to compare the relative merits of the direct crushing and the flooring processes without dealing carefully with the physical characteristics of the ground treated, but a benefit appealing with particular force to the controllers of new diamond mines lies in the greater facilities provided by a crushing plant for demonstrating the producing capacity of the mine to nervous and expectant shareholders, with the least possible delay.

Concrete mortar blocks are generally allowed to set at least three months, but at Redjang Lebong mine the reinforced-concrete mortar blocks could only be allowed 30 days for setting. These have been used for some time without showing any weakness in the concrete.

Water Losses at Broken Hill*

By T. H. Palmer[1]

While there is the constant fear of water famines hanging over the Broken Hill mines, and in view of the engineering difficulties, great cost, and length of time required to establish a supplementary supply, it is interesting to inquire whether the mines can do anything toward reduction in consumption, and whether such reduction in consumption will represent a profitable investment for capital so expended.

In starting, it is well to remember that our early concentrating methods were copied from processes found suitable for countries having an abundant water supply, where it would be folly to spend capital on water-saving appliances, and where, in some instances, it is unnecessary even to return the mill water for further work. Our limited conditions of water supply make such methods wasteful in the extreme. Radical changes, however, cannot be made suddenly, but only by degrees. This is why we still find on most of the mines numerous instances of water losses that have not yet been completely obviated. Nevertheless, so much has already been done to improve matters, that to go further demands close investigation. The purpose of this paper is to make an inquiry into the subject, and to attempt to arouse keen consideration and healthy discussion among those interested.

The number of ways in which water losses can creep into mine work is almost incredible. Water is used in such a large number of operations, and for such diverse purposes, that, unless the greatest care is exercised in design and supervision, waste is almost sure to occur. Although in a short paper like this I cannot hope to do more than treat the subject in a rudimentary manner, I hope that, by pointing out the chief causes of loss, the means of correction will readily suggest themselves.

I will consider the losses under three headings: boiler water, or all water used for steaming purposes; mill water; casual water, or all water used that does not come under the other two headings.

Boiler Water

Losses of boiler water can be subdivided under three heads: (a) In its conversion to steam; (b) in its distribution of steam to engines; (c) after it is exhausted from engines. All losses occurring under (a) or (b) increase the coal consumption.

In its conversion to steam there are losses due to leakages and blowing off. In a well attended boiler plant, however, leakages are likely to be trivial, but the quantity blown off depends almost entirely upon the quality of the feed water. At Broken Hill this loss is considerable. About half of this blow-off water can readily be saved and used in the concentrating mill, but probably considerable of the original feed water escapes in the vapor form, and it would not pay to recover this. Those mines which condense a considerable portion of the exhaust steam and return it to the boilers have a proportionately smaller amount of blow-off loss.

In the distribution of steam to engines, leakages and condensation are likely to occur in the pipes. Especially with high-pressure steam, leakages are very difficult to keep entirely under control. Occasionally, however, through irregular work, or, perhaps, negligence, the safety valve will blow off. The greatest loss usually arises from condensation in the pipes, which is considerable with long lines, or where effective superheating is not in vogue. If steam traps are used it is seldom one notices any attempt to collect the water for further use.

After it is exhausted from engines is where the most serious of all the boiler water losses occur.

Two rival condensing methods are in use: one surface condensing, the other atmospheric condensing. The surface-condensing method attempts a saving of fuel as well as of water, but fails as a water saver, since water losses in the cooling tower are greater than the quantity condensed. Moreover, the variations in climatic conditions, coupled with the high cost of water, make it necessary to have a much larger plant in Broken Hill than at more favored places. A surface-condensing plant, if designed to suit winter conditions, would prove highly profitable during the cold weather, but would be quite inadequate for the summer months. If designed large enough for the hottest day, the capital cost is too great to permit of adequate interest being made out of the saving of fuel—at least from the point of view that a mining company reckons. Additional objections are: The constant expert attention necessary; the risk of failure; its unsuitability for winding engines, pumps, compressors, and other intermittent steam units.

Atmospheric condensing aims only at a saving of water from the exhaust steam of engines that is pure and suitable for the boilers. The plant consists of a series of tanks built of galvanized corrugated iron, through which the steam passes, and finds a large area of cooling surface to condense on. The plant is cheap to install, costs nothing to operate, needs no attention, and the cost of upkeep is small. The exhausts of all steam engines can be turned into it. It is a method that has many advocates at times of water famine, and under ordinary conditions is far more profitable than its rival, surface condensing.

Mill Water

The losses of mill water may be subdivided into four classes: irregularities due to neglect; leakages; evaporation; and in the products.

Irregularities occur more frequently than one would imagine, and loss due to neglect is large enough to deserve mention. There are innumerable ways in which this can happen, of which stoppages of return pumps, elevators, and other machinery are usually the most serious. Sometimes the storage tanks are allowed to overflow. In order to reduce such losses catchment tanks of large capacity are required, and should be connected with the suction of the mill return pumps.

Leakages, where seen, are usually corrected, and do not form a serious proportion of the mill losses. It is the unseen leakages that are liable to be important factors. It is likely that the old concrete floors are cracked in a number of places, which let the water through, and these are not suspected, being covered over by dirt and slime. It is impossible to estimate losses from this cause.

Evaporation must play quite an important part in mill losses. There are a very large number of wetted surfaces. Exposed timber, floors, launders, and all woodwork are porous, and suitable for rapid evaporation, and, with tables and vanners, present numerous surfaces. The low temperature of concentrating mills in hot weather is indicative to some extent. I have often tried to gage this loss, but my computations are very rough. Nevertheless, I believe that, on a very hot day, fully 15 gal. of water are evaporated for every ton of ore treated. The only way to reduce this loss would be to limit the circulation of air, and that would affect the lighting. Moreover, the loss is only large in the summer months.

The water entangled with the products represents a continuous loss that can be estimated and is found to be large. Concentrates and coarse tailings in trucks are usually allowed to stand on the mill floors for some time to drain before being disposed of. These products usually go out with from 8 to 12 per cent. of admixed water, equal to, say, 18 to 24 imperial gal. of water per ton of ore treated. To reduce this loss, and to save handling expenses, some of the mines have erected draining vats and conveyers, by which about half of the above-mentioned loss is saved. In the slimes and vanner tailings the loss varies greatly at the different mines, but is always very high. In most cases the slime is allowed to flow to its destination, where the water is clarified in pits and returned for further use. Losses of water occur by soakage, evaporation, and by breaks in the dams, and are very great. This method is very costly in loss of water, pumping costs, upkeep of

*Abstract of a paper read before the Scientific Society of Broken Hill.

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pits, and area occupied by the pits. I am inclined to think that thorough unwatering with mechanical disposal will be found more economical, provided a dumping site can be found within reasonable distance of the mill.

Casual Water

By casual water I mean water used for all purpose other than for boilers and in ore treatment; it includes that used in the change house, offices, surface standpipes, fire service, etc., and for water jets underground. Men are very wasteful in the change house, and often use many times more water than they require from a prevailing spirit of extravagance. If this water can afterward be used profitably in the mill, such extravagance does not matter much, but otherwise it is an item in the costs, and can be kept within control by reducing the pressure in the mains. Standpipes about the surface are apt to be a source of great annoyance and waste. Men like to run off 40 or 50 gal. of warm water on a hot day, so as to finally get a cool mouthful. Any inventive mind can rectify this waste. In the mine the use of water jets with the rock drills is apt to be abused. I have often seen the holes being bored dry, and the jet turned into the ore chute. Water for the jets is usually seepage caught at various levels, and made to do work on its way down to the pumps. No doubt there is some waste, but not much, and this is usually a matter of little importance.

To show how much can be done in the direction of water savings, the consumption at the Junction North mine was recently over 200 gal. of mine water and over 200 gal. of fresh water per ton of ore treated. Now it is 150 gal. of mine water and 40 gal. of fresh water per ton of ore. I hope to reduce the consumption still further, so as to use about 90 gal. of mine water and 4 or 5 gal. of fresh water per ton of ore. The fresh water will then only be used in the offices and change house.

Water Saving at the Junction North Mine

There is a liberal water supply available in the underground workings of the Junction North mine, and the policy has been to make this sufficient for all requirements, so that the company will be entirely independent of all outside water schemes, and safe for periods of water famines, in addition to the saving of costs that will come about. The water contains 673.36 grains of solids in a gallon, or 0.9619 per cent. by weight, as follows:

	Grains per Gal.	Per Cent.
Silica	1.47	0.0021
Oxides of iron and alumina	2.24	0.0032
Calcium sulphate	111.12	0.1587
Magnesium sulphate	155.44	0.2220
Zinc sulphate	67.52	0.0965
Sodium chloride	306.89	0.4384
Loss on ignition	14.42	0.0206
Unaccounted for	14.26	0.0204
Totals	673.36	0.9619

This water is quite suitable for milling purposes, but could not be used in the Babcock & Wilcox boilers. But, owing to the fact that 78.7 per cent. of the solids are soluble in very strong solutions, it was deemed suitable for Lancashire boilers. The magnesium sulphate was not thought likely to cause priming if only a limited amount of power was demanded. Accordingly, a very suitable arrangement has been made, and is now in use, by which the boilers use only mine water for the make-up feed supply.

To accomplish these results a very complete system of atmospheric condensers has been installed to deal with the exhaust steam from every engine on the mine. There are 38 atmospheric condensing tanks coupled together in three systems. Each system has a wrought-iron breakdown tank, or feed-water heater, to take the impact of the exhausts. The condensed water gravitates to the boiler-feed tanks, and the Babcock & Wilcox boilers are fed exclusively with it, so that blowings off and cleanings are reduced to a minimum with that type. Mine water to represent the "make-up," amounting to nearly 20 per cent. of the total feed water in hot weather, is fed to two Lancashire boilers, which have been retained for operating the winding engine and No. 2 compressor. In these boilers there is a fair amount of sediment and scale formed. Blowings off and cleanings are needed frequently, but the whole is an economical and reliable arrangement, not only from a water point of view, but a reduction is already noted in the coal consumption by reason of the cleaner condition of the Babcock & Wilcox boilers. Although only lately set to work, it is evident that quite 80 per cent. of the original boiler-feed water will be saved in the hot weather, and this represents in cash a saving of more than 100 per cent. per annum on capital outlay after allowing liberally for repairs and depreciation. Eight of the tanks have been in use for over 18 months, and, except for a little soldering, have cost nothing for repairs. It is only fair to mention that the surface plant is so distributed that the mine possesses singular features in favor of the system by which the exhausts from all engines can be collected economically. In the mill a number of details are being given a trial in order that water losses will be reduced to a minimum. On the surface a drainage system of pipes is about to be put in, by which waste water will be collected from offices, change house, concentrates bins, and will be led to a boiler and economizer blow-off tank, from which it will be returned to the mill.

The *Queen. Gov. Min. Journ.* places the value of the output of the copper mines of New South Wales for 1908 at £302,812. This is £224,962 less than in the previous year.

Mineral Production of Germany

The production of metallic ores—other than iron—in the German Empire for the years 1907 and 1908 is reported as follows, in metric tons:

	1907.	1908.
Gold and silver ores	8 279	7,654
Copper ore	771,227	727,384
Lead ore	147,272	156,842
Zinc ore	698,425	706,441
Manganese ore	73,105	67,693
Various ores—tungsten, etc	7,997	8,718
Arsenic ore	4,878	6,081
Pyrites	196,351	219,455
Other sulphur ores	1,010	411

A considerable decrease in copper ore, and small increases in lead and zinc ores are the chief features of the statement. The figures are taken from *Glückauf*, being an advance statement from the Imperial Statistical Office.

Nonmetallic Products

The nonmetallic production—other than coal—is as follows, in metric tons:

	1907.	1908.
Graphite	4,033	4,844
Asphalt	126,649	89,009
Petroleum	106,379	141,900
Rock salt	1,285,138	1,327,453
Kainit	2,624,412	2,589,804
Other potash salts	3,124,956	3,500,635
Kieserit, glauber salts, etc.	5,503	6,505
Boracite	114	128

There was a gain in potash salts, but a decrease in several of the minor products.

Metallurgical Products

Metals and other products of metallurgical works were as follows, not including iron and steel, which are given elsewhere:

		1907.	1908.
Gold	Kg.	4,682	4,758
Silver	"	386,933	407,833
Copper	Tons	32,473	30,329
Lead	"	146,596	169,418
Zinc	"	208,195	216,490
Arsenical products	"	2,904	2,822
Sulphur	"	176	810
Sulphuric acid	"	1,393,398	1,385,740
Copper sulphate	"	5,284	7,117
Zinc sulphate	"	5,145	5,310
Iron sulphate	"	14,033	15,738
Metallic pigments	"	4,469	3,936
Miscellaneous	"	6,684	7,230

Gold and silver include metal from foreign ores. Under tin there are given 5838 tons in 1907, and 6375 tons in 1908 of tin manufactures, as well as 1812 tons in 1907 and 2266 in 1908 of tin salts. These were made from imported ores and metal. Copper in 1908 included 328 tons black copper, the rest being refined metal.

Potassium and Other Salts

The production of potassium and other salts in commercial form was as follows, in metric tons:

	1907.	1908
Salt	665,416	665,413
Potassium chloride	473,138	508,622
Magnesium chloride	32,891	29,775
Glauber salts	80,347	72,667
Potassium sulphate	60,292	55 755
Potassium-magnesium sulphate	33,368	33,149
Magnesium sulphate	41,105	42,976
Aluminum sulphate	59,473	54,122
Alum	4,200	3,802

On the whole the production of potassium salts, of which Germany has almost a monopoly, was fairly well maintained last year.

A Blast Furnace of Oval Section*

At the recent meeting of the Iron and Steel Institute in the Middlesbrough district in England, visiting engineers were much interested in No. 5 blast furnace of the Newport Iron Works, recently built. The peculiarity of this furnace is its form, which is oval, not circular, the design being the patent of Francis Samuelson and William Hawdon. The aim of the inventors was said to be to obtain a large output with a lower initial cost, and a more economical operating cost.

Requirements of a Furnace for Large Production

The three essentials in a plant for large makes are: The necessary area in the melting zone of the furnace, or at the level of the tuyeres, where the oxygen of the air blown in is brought in contact with the fuel which, of course, produces the necessary heat to smelt the ore; capacity of blowing engines, by which is understood the necessary volume and pressure of blast; and sufficient stove capacity to heat up the volume of air to the required temperature.

American pig-iron makers obtain the first essential by increasing the diameter of the well of the furnace at the tuyeres to get the larger area at the melting zone. This, of course, has necessitated a corresponding increase in the power of the blowing engines, in order to obtain the necessary blast pressure to penetrate the additional mass of ore in the well of the furnace. It is well known that if the mass is not thoroughly penetrated by the blast, a center cone remains unmelted, which not only adds materially to the consumption of fuel, but prevents the making of good iron.

Cost of High Blast Pressure

This increased pressure is the principal and most serious matter for consideration. Increased capacity, as regards dealing with the volume of air for increased makes, is necessary in both blowing engines and stoves. The stoves, to withstand the higher pressure, have to be more strongly built, and are, therefore, more costly. But the most costly item, and the one which it was sought to avoid in the oval furnace, is the enormous strength requisite in the blowing engines, which, of course, increases with the pressure of blast required, and because of the additional strength required to withstand the higher pressure, the air mains and adjuncts are also more costly. A blast pressure of 5 to 6 lb. per square inch was usual under the older designs; one of 12 to 15 lb., or even more, is common with the new design adopted in American practice.

*Abstract of article in *Iron and Coal Trades Review*, London, England.

The oval furnace built by Messrs. Samuelson at Newport is blown by the old blowing engines, and works on a pressure of 6-lb. blast with very great regularity, while the results, both as regards make and fuel consumption, are highly satisfactory. The furnace, which is making Cleveland iron, averaged over the three months ending with May last, an output of 1344 tons per week, the best four weeks averaging 1447 tons per week. The installation of this furnace required no alteration in the existing plant.

It is obvious that an engine giving 15-lb. per square inch pressure of blast requires about two and one-half times the horsepower of an engine blowing 6-lb. blast pressure, in addition to which the boiler capacity must be proportionately greater. Blowing engines made for such high pressures are costly units, and require considerable labor and attention in repairs. Hence, well on to 50 per cent. of the horsepower required for the production of the higher pressure of blast is saved in an engine of lower pressure, and this power becomes available for generating electricity, or for other purposes—a great advantage where there are steel works in connection with the blast furnaces.

Construction of the Furnace

The inventors claim that the adoption of their oval furnace, whether in an old or new plant, is productive of this valuable saving of power in the blast. The accompanying views show, in Fig. 1, half cross-sections of the furnace at two points; in Fig. 2 a half sectional elevation, and in Fig. 3 a cross-section at the tuyeres. It will be seen from these sections that the oval well on its minor axis is much narrower than a round furnace would be. The distance, therefore, from tuyere to tuyere is less, and consequently a lower pressure of blast penetrates the material in front of the tuyeres and at the melting zone in the furnace. With a round furnace of the same area, the diameter is necessarily large, and consequently there is a greater distance from tuyere to tuyere. Therefore, a greater pressure of blast becomes necessary.

Fig. 1 shows how girders are placed both round the shell and vertically, to strengthen the oval form. The pressure

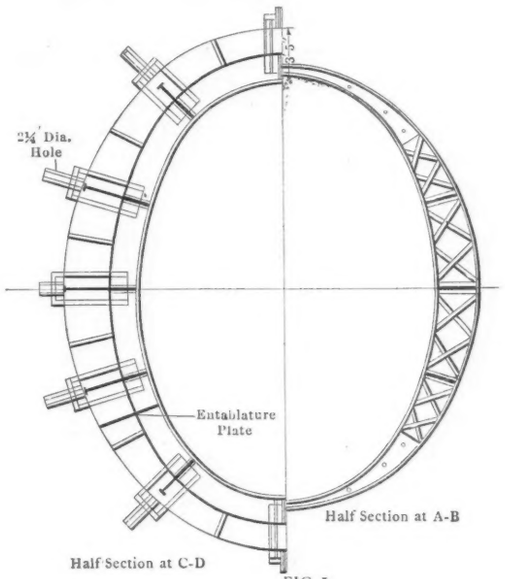


FIG. 1

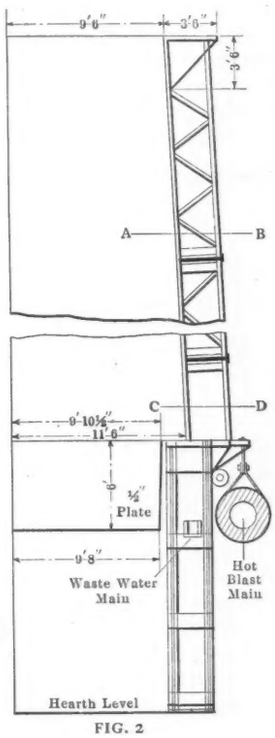


FIG. 2

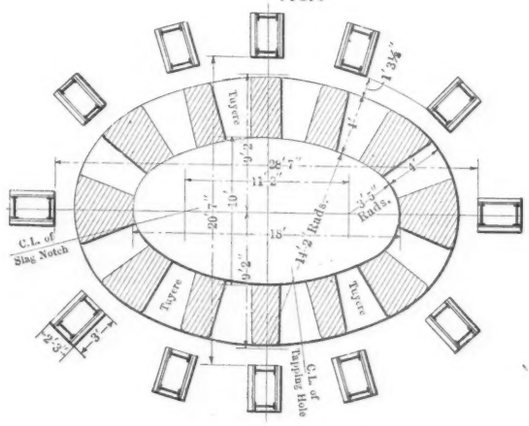


FIG. 3

OVAL SECTION BLAST FURNACE AT MIDDLESBROUGH

of materials inside the furnace, without this support would tend to bulge out the sides of the oval. These girders are composed of 9-in. beams at the ends, and increased to 4 ft. by 7½ in. deep lattice girders of the sides. The charging bell is oval, giving an equal distribution of materials at the top of the furnace, which is maintained throughout the melting process.

Results from the Furnace

A certain amount of doubt was expressed by experts as to whether the oval would work with as great regularity as the circular form, but this has apparently been quite set at rest by the very regular working of the furnace in question, which has since its erection, given less trouble than almost any other furnace at Newport works. It is also said by the builders and owners that while the make of the furnace is large, the iron is also more regular in quality than that from the old furnaces at the same works. This regularity is an advantage which must be appreciated by all furnace operators.

Apparatus for Surveying a Bore-Hole

In a recent issue of *Annales des Mines de Belgique*, Jean Florin describes the construction and operation of a novel device for determining the strike of the strata and the direction of a bore-hole at its bottom. The merits of the apparatus are that all clock motions and other complicated mechanisms are avoided, that it does not need to be built with the strength necessary to withstand great pressure, that its operation is simple, its cost small, and its accuracy perfect.

In brief, it consists of a brass box, filled with water, in which is suspended by rubber bands *i*, a simple photographic camera *a*, below which are a magnetic needle *b*, a phosphorescent disk *c*, and the interchangeable soft lead disk *d*. Holes *e*, around the top of the box, protected by shields and wire gauze, allow the box to fill with water while excluding light and dirt.

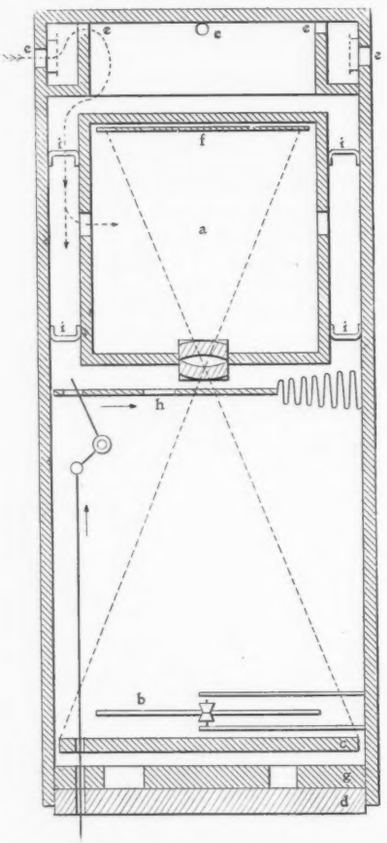
The photographic camera is a metal box *a*, inside the top of which can be placed a round frame carrying a sensitized celluloid plate *f*. This is so placed as to receive the image of the magnetic needle and certain reference marks on the phosphorescent disk. The lens has a focus of about 4 cm., and is ground with special reference to the refraction between glass and water. In front of the lens is the shutter *h*, which is operated by pressure on the end of a rod which projects down through the bottom of the outer box.

The magnetic needle is supported freely, its vibrations not being restrained at any time. Immediately below the needle is the copper disk *c*, coated with a substance, containing calcium sulphide, insoluble in water. On the disk are also drawn black lines to serve as reference marks.

At a short distance below this is a disk of phosphorus bronze *g*, of a sufficient thickness to stand some battering, through which are bored four holes of different sizes. These holes serve as points of reference to assure that the lead disk does not move while the apparatus is in operation; other reference marks allow the bronze disk to be placed always in the same position. At the very bottom is a disk of soft lead intended to receive on the outside an impression of the stump of the core, and on the inside an impression of the four holes in the bronze disk.

Preparing the Apparatus for Use

To prepare the apparatus for use, the



SECTION OF INSTRUMENT FOR SURVEYING BORE HOLES

phosphorescent plate is first excited by a flash from a short piece of magnesium ribbon; the illuminating power will last for four or five hours. The disk is then replaced and the bronze and the lead plates are firmly secured. The sensitized plate is then put in, in a dark room, the top is closed, and the entire apparatus is filled with water, care being taken to remove all air bubbles. If the temperature of the water encountered in the bore-hole is likely to be higher than the melting point of the gelatine on the sensitized plate, before putting the plate into position it can be treated with a 5-per cent. solution of formaldehyde, which makes the gelatine insoluble and yet does not interfere with the exposure nor the development.

Having freshly broken off the core and marked it distinctively by a blow from a chisel bit, the brass box is lowered on the end of the drill rod. The weight of the rods causes the desired impressions to be made on the lead, and at the same time the shutter of the camera is opened. The magnetic needle soon comes to rest, and an exposure will generally take 20 to 30 min. On drawing up the rods the shutter closes.

The data given by this operation are an impression of the bottom of the hole, on the under side of the lead disk and on the upper side, the marks of the four holes, which orient the lead disk with respect to the camera. On the sensitized plate, after development, are seen the image of the needle and of the black marks on the phosphorescent plate. From these data the strike of the strata and the direction of the bottom of the hole can be ascertained.

Although the author does not mention it, it would appear quite feasible, by supporting the camera box in such a way that its axis should always be vertical, to ascertain the deviation of the hole from the vertical by noting the distance that the center of the needle appears to be offset from the center of the developed plate. The use of a phosphorescent illumination also appears to be a decided improvement over any kind of electric lighting.

Prices of Lake Iron Ores

The average prices of Lake iron ores in Cleveland in early days are given in an interesting historical article in the *Marine Review*. For the year 1857, the average selling price of ore per ton was $8; in 1858 it was $6.50; in 1859 it was $6; in 1860, 1861 and 1862 the average was the same each year, or $5.25 per ton; in 1863 it was $7.50; in 1864 it was $8.50; in 1865 it was $7.50; in 1866 it was $9.50; in 1867 it was $10.50; in 1868 and 1869 it was $8.25; in 1870 it was $8.50; in 1871 it was $8; in 1872 it was $9; in 1875 it was $7; in 1876 it was $6.75; in 1877 it was $6.50; in 1878 it was $5.50; in 1879 it was $6.25; in 1880 it was $9.25; in 1881 it was $9; in 1882 it was $9, and in 1883 it was $6.25 per ton.

The Rhodesian Chamber of Commerce has asked the government to appoint a medical commission to investigate sanitary conditions among the Kafir laborers employed in the mines. These appear to be improving, as the average death rate fell from 73.18 per 1000 in 1907 to 48.78 in 1908. The principal diseases prevalent among the Kafirs are pneumonia and scurvy.

Electric Mine Signaling

An ingenious method of shaft signaling by electricity, as adopted at two of the shafts of the Grand-Hornu company, is described in a recent issue of the *Annales des Mines de Belgique*. Alternating currents, of 110 volts and 25 cycles, are used at both places; this permits a simpler construction of the bells than when a direct current is used. The system is so designed that a signal rung from underground will sound both at the landing floor at the surface and in the hoisting room, and also so that signals can be sent from the landing floor to the hoisting room and to the underground station.

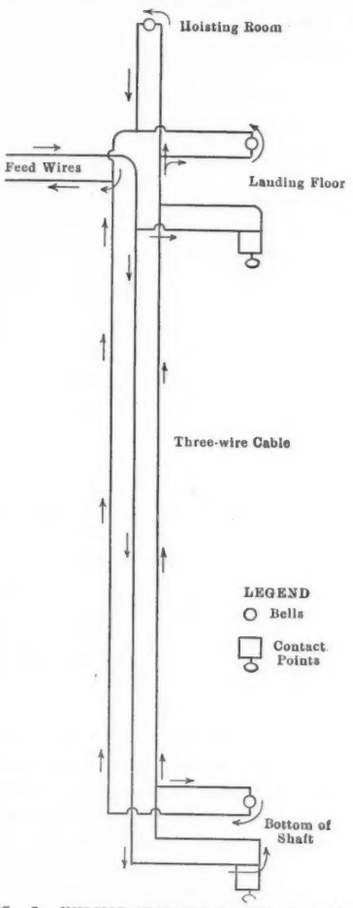


FIG. 1. WIRING SYSTEM AT NO. 9 SHAFT GRAND-HORNU COMPANY

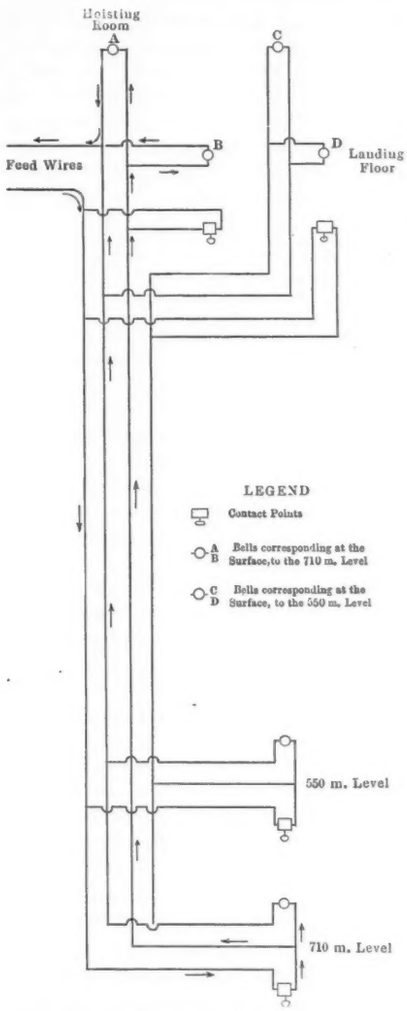


FIG. 2. WIRING SYSTEM AT NO. 7 SHAFT, GRAND-HORNU COMPANY

At No. 9 shaft all the hoisting is done from the one level. At the bottom and at the landing floor are placed a bell and a contact point and at the hoist is a bell, but no contact point; they are all inclosed in cast-iron boxes, tinned to prevent rust. The cable has three 1-mm. copper wires, in an iron casing attached to the timbers in the shaft.

The arrangement of the wiring is shown in Fig. 1, in which the arrows point the direction of the current while a signal is being given from the bottom. It is seen that the bell at the bottom rings at the same time as the others. All three bells can also be rung by making contact at the landing floor.

At No. 7 shaft hoisting is being done from both the 550- and the 710-m. level. To avoid confusion in the hoisting room and at landing floor, the bells connected with one level are made of bronze and those connected to the other level are made of steel; by this means two different tones are produced. The wiring is also arranged so that a signal given from one level is not heard on the other level, thus avoiding unnecessary confusion. In Fig. 2 the arrows show the direction of the current at the moment the operator on the 710-m. level is giving a signal; his own bell rings with the others.

The signals are given in the same code as with a bell operated by rope, but it is also possible to use a system based on long and short strokes.

It is announced by *l'Echo des Mines* that an agent of the Carnegie Steel Company, while searching for manganese ores in India, discovered a valuable deposit of tungsten ore in the Central Provinces, near Nagpur.

The Sturtevant Ring Roll Mill

A new crushing roll has recently been introduced by the Sturtevant Mill Company, of Boston, Mass. This roll consists essentially of a massive outer ring, with a concave inner face, which revolves vertically. Within this outer ring revolve three rolls with convex faces; these are pressed by springs against the concave inner face of the outer ring. They are usually adjusted to crush at about 20,000 lb. pressure. When the machine is in operation the inner face of the outer ring is covered with a 1-in. layer of material to be crushed.

The outer ring is bolted to a massive head which is revolved at about 75 r.p.m. by its horizontal shaft. There are no shields for the prevention of wobbling, the massive construction being ample provision against this fault. The whole front of the mill opens like the massive door of a safe, swinging the rolls and their parts outside and exposing the whole interior. The outer ring alone is left inside; thus it is easily accessible for examination or replacement. On closing the door the three inner rings and all their parts swing into place, the adjustment of the pressure being controlled by a screw on the outside of the door. Provision is made for holding the inner roll away from the outer ring.

Material to be ground is supplied by an automatic feeder to the middle of the concave outer ring, by way of a chute. The inner rolls do not come in contact with the outer ring, but work on the layer of material, gradually forcing the fines off of both sides of the track. The mill takes material direct from a rock breaker in 1½ in. or smaller size.

The first award of a prize for discovery or invention under the will of Aeneas McCharles, who left a fund of $10,000 for that purpose, will be made this year by the board of governors of Toronto University, Toronto, Canada, the amount being $1000. It will be open (1) to any Canadian who invents or discovers any new and improved process for the treatment of Canadian ores, or minerals, after such process has been proved to be of special merit on a practical scale; or (2) for any important discovery, invention or device that will lessen the dangers and loss of life in connection with the use of electricity in supplying power and light; or (3) for any marked public distinction achieved in scientific research in any useful practical line.

A sanatorium for patients suffering from miners' phthisis (*Aust. Min. Stand.*, Dec. 23, 1908) is to be erected on the Rand. The mines propose to allot £13,000 for its erection, and the government is to be asked for material support.

The Diamantina District of Minas Geraes

By G. W. Lindsay*

Diamonds are found in Brazil in three separate districts: (1) In the state of Bahia, near the east coast of Brazil; (2) in the northern part of Minas Geraes; (3) in the far interior, in the states of Goyaz and Matto Grosso. The Bahia district has produced comparatively few diamonds of the finest quality and is noted chiefly for the production of carbonados, or black diamonds, used in diamond drills. By far the greater proportion of the world's supply of carbonados comes from this field. The diamond-producing district in Goyaz and Matto Grosso is as a whole practically unprospected. Its great distance from civilization, and the absolute lack of transportation facilities make it of no practical importance at present.

The chief source of Brazilian diamonds is what is known as the Diamantina district, situated in the northern part of the state of Minas Geraes, about 500 miles north of Rio de Janeiro. This field is a narrow strip from 20 to 40 miles in width extending from the headwaters of the Jequitinhonha river, down this stream for about 200 miles.

Discovery and Early Production

This field was worked for gold as far back as 1670. In 1729 diamonds were discovered in the streams and for many years the Crown of Portugal exploited this district on a large scale, importing negro slaves for labor. When Brazil became an independent empire the work was continued under the direct protection of the state. During this period the output of the district reached its maximum, about 150,000 carats annually.

For about a century and a quarter Brazil produced nearly 90 per cent. of the world's supply of diamonds. In the latter half of the last century the output of this region suddenly decreased, until in 1890 only about 1000 carats were taken out. This was due to several causes, chief among them being the exhaustion of the more easily worked placer deposits, the loss of the slave labor, etc. Since 1890 the output has slowly increased, until in 1905 about $200,000 worth of diamonds were sent out. American companies have recently obtained large concessions in this region, and with the application of modern machinery and methods it is expected that this district will again take rank as an important diamond-producing field.

Source of the Diamonds

The original source of the diamond-bearing ground in this district was apparently a number of "pipes" or funnels, through which the diamondiferous clay was forced up to the surface. These pipes are thought to be similar to those which are being worked at present in South Africa. If they should prove so, they will undoubtedly become the chief source of diamonds in this district. At present this class of deposit is undeveloped, and its value is more or less conjectural.

From these primary deposits the diamonds were scattered all over the district, being found in a sheet of conglomerate which apparently at one time overlaid the entire region. Scattered through the district many small patches of this conglomerate are still found in place on the hill sides. It is a deposit ranging in thickness from 2 to 6 ft., consisting of coarse water-worn gravel firmly cemented together. It is worked to some extent by the natives, and in some instances might yield largely on the application of modern machinery and methods.

Production from Placer Workings

The greater part of this conglomerate has been washed down into the Jequitinhonha and its tributaries by the excessive tropical rainfall, forming a series of exceedingly rich placer deposits. It is from these placers that practically all of the diamonds produced thus far have been taken. The method formerly employed was to dam the stream, carry the water off by means of ditches or rough flumes, and dig out and wash by hand the bed of the river thus laid bare.

With thousands of negro slaves to supply the needed labor, it was possible to work the smaller streams and even the Jequitinhonha itself for some 30 miles from its headwaters, by this crude method. But as the smaller streams were worked out this method became more and more expensive and difficult, until on the freeing of the slaves it was abandoned altogether. Since that time no attempt at mining on a large scale has been made in this district until the last year or two.

Diamond-washing Dredges

Several American companies have obtained concessions on the Jequitinhonha, and two modern gold dredges, adapted to diamond saving have been already installed. The larger of these dredges is of the standard endless bucket-line type, with 3¼-cu.ft. buckets and a digging capacity of from 1800 to 2000 cu.yd. per day. The process used in recovering the diamonds is simple. The gravel dug up is carefully sized in a series of trommels, and the gravel from one-sixteenth to three-fourths of an inch in size is jigged. The diamonds are sorted out from the jig concentrates by hand. The sand is run over gold-saving tables in the ordinary manner, no attempt being made to save any diamonds it may contain. These river placers usually run from 5 to 15c. per yd. in gold besides their diamond values.

The diamonds from this field are of the first quality and color, and the average size of the stones is also good, though in Africa many individual diamonds have been found much larger than any yet discovered in Brazil.

*Mining engineer, Morenci, Arizona.

Iron and Coal in Germany

The official report of the iron-ore production in Germany for the full year, as published in *Glückauf*, gives the totals mined as follows, in metric tons:

	1907.	1908.
Elsass-Lothringen	14,107,518	13,281,589
Luxemburg	7,492,870	5,799,280
Other districts	6,096,740	5,152,487
Total	27,697,128	24,233,356

In 1908 Elsass-Lothringen furnished 54.8 per cent. of the total output, and Luxemburg 23.9 per cent.

Pig Iron Production

The official statement of pig-iron output is as follows, in metric tons:

	1907.	1908.
Foundry iron	2,048,502	2,102,375
Direct castings	71,377	71,466
Forge iron	900,239	696,373
Spiegel and other alloys	931,140	837,067
Bessemer (acid) iron	478,011	422,448
Thomas (basic) pig	8,428,334	7,657,884
Scrap, cinder, etc.	17,556	17,708
Total	12,875,159	11,805,321

This statement differs slightly from that of the German Iron and Steel Union, heretofore published, which is based on current reports from furnaces.

Finished Iron and Steel

The forms in which iron and steel products were put upon the market are reported as follows, in metric tons:

	1907.	1908.
Castings (second smelting)	2,553,446	2,306,678
Wrought (puddled) iron	617,900	491,318
Crucible steel, all forms	40,443	26,306
Steel ingots	670,882	690,186
Blooms, billets, etc.	1,980,495	1,899,228
Finished steel, all forms	8,736,010	8,125,749

The forms given for steel are those in which the metal was sold by the works where it was made. The steel ingots, blooms, etc., were worked into finished forms at mills which do not make their own steel.

Coal Production

The production of coal in the German Empire is given as below in metric tons:

	1907.	1908.
Coal	143,185,691	148,537,517
Brown coal (lignite)	62,546,671	66,746,057
Total	205,732,362	215,283,574

The total increase in 1908 was 9,551,212 tons, or 4.6 per cent. Brown coal, or lignite, was 30.4 per cent. of the total in 1907, and 31 per cent. last year.

The directors of the Mount Bischoff Tin Mining Company, Tasmania, have declared the 383d dividend of 5s. per share. The amount of dividend is £3000, which brings the total paid by the company up to £2,166,000.

Locus of Vadose Ore Deposition

By Charles R. Keyes*

By reason of their direct practical bearing upon the local occurrence of orebodies according to definite lines of geologic structure the results of recent investigations in the Ozark region have proved to be of exceptional interest to the mining industry. For the first time in the history of the development of the region no definite data appear for quantitative considerations. The principles involved have, moreover, a much wider than local application.

The principal lead and zinc deposits of the Ozark region are strictly vadose accumulations. In the main the orebodies correspond to the enrichment zone of normal fissure-veins. Otherwise there is no resemblance between the two classes of orebodies. There is, in reality, no zone of impoverished oxidized ores above, nor of a normal low-grade orebody beneath. Moreover, the general migration of ore materials has been in a lateral direction rather than merely downward, as is usually the case. In this general side-movement the direction and interference of ore movement has been controlled very largely by local geologic structures. Among the latter the basin, trough, or syncline has been the leading type.

The general association of the workable ore deposits of the Ozark region with basins appears far more significant than a first glance might suggest. It seems to make small difference what is the origin of these basins. They may be formed by true synclines, in flexed strata by old erosion-troughs along planes of unconformity, by warpings of impervious strata, by cross-folds in structural troughs, by solution cavities, by underground waterways dammed by débris, by faulting, by dike-intrusions, by lack of local erosion in sloping strata, or even by other features. The principal point to be considered is that the introduction of these structures gives rise to an impounding of the underground waters; and a production, on new lines, of all of the old conditions of permanent ground-water-level.

Sulphatic waters passing into or through such subterranean ponds invariably deposit some of their metallic salts as sulphides just as they do in the enrichment zone of normal fissure-veins. How the precipitation takes place is, in the present connection, immaterial. It may be through means of the mingling of different currents, the presence of organic matter, the association of carbonaceous materials, or the presence of decomposing sulphides. In this zone and under impounding conditions there are usually present at all times an abundance of adequate reducing agents.

In the Southeast Missouri Lead district the localization of the orebodies appears to be influenced chiefly by the character of the Pre-Cambrian troughs eroded out of the much older granites. The Central Missouri district presents true structural troughs, or synclines, as the controlling feature, although subterranean channelways now filled with sandstones and bituminous shales or clays have occasioned minor orebodies. Both synclines and faults have produced basin conditions in the Northern Arkansas district. In the Upper Mississippi Lead district synclines alone of the original geologic structures are the determining factors.

Conditions are complex in the Southwestern Missouri Zinc district. That they appear more complicated in this area than in other districts may be due partly to the fact that this district has received more detailed study than any of the other fields. The great Springfield-Joplin syncline pitching westward down the slope of the Ozark dome clearly explains many of the former puzzling features connected with the distribution of the orebodies. The cross-arches long known in the vicinity of Galena, Joplin, Webb City, Carthage and other places are thought to be of first importance in ore-localization. Close-patterned warping of the strata has been suspected ever since the detailed large-scale topographic maps of the Carthage, Joplin and other quadrangles were first constructed by the Missouri Geological Survey more than a decade and a half ago. Although not so accurate as it might be, but still presenting the broader features fairly well, the late publication by the U. S. Geological Survey showing the underground contours of the Grand Falls Chert surface, displays in a remarkable manner the relationships of the orebodies and the basins.

Orebodies in large solution cavities, particularly along the master-lines of jointing, and in dammed underground waterways, are also of common occurrence in the Joplin district. Corrosion-channels in the plane of unconformity at the base of the Coal Measures do not at present appear to exist. So far as personally known the débris-sandstones and shales usually found in this connection are not depositions of Carboniferous age at all. All appear to be fillings of very recently formed underground channelways that have caved in or filled up without the roofs giving away. As such there must be seldom any real relationship between the pre-Coal Measures drainage-lines and the orebodies.

The Ozark region is a field in which some of the structural features mentioned are not at first sight easily determined. The general dips of the strata are so small, the flexing so slight, the warping so close-patterned that it has been only through the application of the most recent and refined methods of investigation that the actual proofs of some of the former deductions were secured. The delicacy of the standard of measurement may be judged when it is stated that warping or flexing of less than a dozen feet may give rise to basins holding the largest of orebodies. The principles involved are perhaps best considered by referring first to examples of other regions where with the same vertical values, the lateral components are infinitely smaller and the angles much higher.

In the Joplin district the profile of the Grand Falls chert, along a line passing through the principal mining camps, brings out several important features. The leading orebodies are seen to be located in the troughs due partly to the close-patterned warping and partly to definite parallel-flexing. The ridges of Galena, Joplin, Webb City, and Carthage, for example, are true anticlines trending nearly northwest. They are the cross-bars of the Springfield-Joplin syncline which pitches nearly due west. The orebodies are thus seen to have definite relationships with the local geologic structures. It seems very probable that the retreating margin of the impervious Coal Measures shales has had an important influence in impounding the underground waters by raising the groundwater level. There is good reason for believing that this has been the direct cause of the localization of many of the orebodies of this district. As the inclination of the groundwater surface is not as great as that of the strata there would be raised at once, at the point where the groundwater-level intersected the basal plane of the Coal Measures formation, a formidable barrier, or dam, which would impose extensive impounding conditions. The Joplin district appears to be just such an area.

In the Central Missouri mining district the series of parallel synclines imparts conditions similar to those of Joplin with the Coal Measures not far away. The orebodies appear to be confined entirely to the bottoms of the structural troughs. With this conception of the field systematic prospecting should make this area a very much more important mining district than it now is.

The general structural conditions in the Southeastern Lead district are also similar to those in the Southwestern area. Corresponding to the warped surface is the uneven erosion surface of the unconformity-plane at the base of the Cambrian rocks. Instead of porous zones, caused by brecciated cherts and limestones, are the porous dolomites. The ores are "disseminated" through particular beds in place of being formed in irregular brecciated zones or into "runs" along underground channels filled with debris. The

*Mining engineer, Des Moines, Iowa.

profile of the Grand Falls chert would then answer, with no essential modification, for a generalized cross-section of the Southeastern Lead field. Only the surface in the Southeast would be an unconformity-surface instead of a warped stratigraphic plane.

Throughout the entire Ozark region the locus of strictly vadose ore deposition thus appears to be wholly dependent upon local and definite geologic structures.

The Institution of Mining and Metallurgy

SPECIAL CORRESPONDENCE

The annual general meeting of the Institution of Mining and Metallurgy was held recently, when a report of the council for the past year was read, together with an address from the incoming president, Edgar Taylor. The report of the council records a satisfactory year. The membership at the close of the year 1908 was 1799, as compared with 1625 at the corresponding date in 1907, there being, therefore, a net increase in the roll of 174 members. The principal award of the institution, the gold medal, was awarded to Dr. James Douglas, in recognition of his services in the advancement of the educational, technical and commercial interests of mining and metallurgy, and of his contributions to technical literature. Previous recipients of this award, which is the highest honor the institution confers, have been John Stewart Macarthur in 1902, Hennen Jennings in 1903, Prof. Hilary Bauerman in 1906, and Sir Archibald Geikie in 1907. Regret was expressed that Doctor Douglas was not able to be present to receive the award in person. It was remarkable that not one of the recipients of medals or prizes was present—a circumstance indicative of the world-wide activity of the members of the profession.

The gold medal presented annually by the Consolidated Goldfields of South Africa was awarded to H. L. Wilkinson, of Melbourne, Australia, for his paper on the "Deep Leads of Victoria, or the Cainozoic Buried Auriferous River Deposits."

The institution takes great interest in educational work, giving several post-graduate scholarships as well as arranging post-graduate courses on some of the principal mines of the world for selected students of the leading mining schools. As many as 16 post-graduate courses were arranged during the year, of which eight were on South African mines, two on Indian mines, four on Australian mines, one at the Tomboy, Colorado, and one at the Ouro Preto in Brazil.

With a view to keeping the colonial members and those who live in foreign countries in closer touch with the work and aims of the institution, the council has been enlarged by electing a number of members living abroad under the title of corresponding members of council.

The presidential address of Edgar Taylor, a member of the well known firm of John Taylor & Sons, was devoted to describing the advances that have been made in recent times in the methods of mining, touching principally on the work below ground. Mr. Taylor called attention to the fact that the papers read at the meetings hardly did justice to this branch of mining work, and expressed the hope that in the coming session papers would be forthcoming, describing the mining methods and equipment on some deep and uptodate mine. He wound up an interesting address by reminding the members that, while mining was to some extent a speculative business and would on that account always continue to attract capital, it was the duty of professional mining engineers to reduce the speculative element as much as possible "and to make Nature disgorge her wealth at the least possible expense, and with the utmost benefit to the treasure seekers by adapting to the best advantage the most scientific methods and the most skilful appliances placed at their disposal by the ingenuity of man for the attainment of that object."

The Delaware & Hudson Company

This company owns and operates an extensive estate in the anthracite coal region of Pennsylvania. It also owns a system of railroads extending from its coal properties eastward and northward to the Hudson river at Albany and Rondout, and northward into Canala. Unlike most of the anthracite carriers, the company operates its coal mines directly and not through a subsidiary corporation. The report is for the calendar year 1908.

The coal statement for the year is as follows, in long tons:

	1907.	1908.	Changes.
Coal on hand Jan. 1.	141,645	374,984	I. 233,339
Coal mined.....	6,623,508	6,526,871	D. 96,637
Coal bought.....	382,478	287,329	D. 95,149
Total.....	7,147,631	7,189,184	I. 41,553
Coal sold.....	6,772,647	6,835,402	I. 62,755
On hand, Dec. 31..	374,984	353,782	D. 21,202

The earnings of the company's railroad lines from the transportation of coal in 1908 were $9,081,664, or 45 per cent. of the total.

The relief fund for the benefit of employees of the coal department shows receipts of $10,443. The benefits paid were $17,828, and the balance at the close of the year $2782. The company contributed $8725 of the receipts.

The earnings and expenses of the Coal Department were as follows:

	1907.	1908.	Changes.
Gross earnings.	$23,184,766	$23,847,117	I. $662,351
Expenses.....	22,227,284	22,994,000	I. 766,716
Net earnings..	$ 957,482	$ 853,117	D. $104,365

Expenses include taxes, which were $292,302 in 1908. The expenses were 95.9 per cent. of gross earnings in 1907, and 96.4 in 1908. The gross earnings in 1908 were $3.49, and the net earnings $0.125 per ton of coal sold, against $3.42 and $0.141 in the previous year.

The report says: "The collieries and washeries of the company were operated to their full capacity throughout the year, producing 6,526,871 tons of anthracite coal out of a total of 64,665,914 produced in the region. At the close of the year there were in the several storage plants 353,782 tons. The Coal Department expenses include construction and betterments amounting to $650,283. Taxes of the Coal Department for the year 1908 show an increase of $76,578.

"The earnings from coal freight traffic show a slight increase, due to the placing by the company of an increased tonnage of its coal in markets securing to its railroad lines a longer haul. . . .

"Early last year an amicable arrangement was made between the United States Attorney General and the anthracite coal-carrier corporations to test the constitutionality of the so-called Commodity clause of the Hepburn act, amending the Interstate Commerce act passed July 29, 1906, which statute attempted to forbid railroad corporations from transporting in interstate commerce any commodity mined, produced or owned by such carrier corporation, or in which it had any interest direct or indirect. In September last the statute in question was declared invalid by the United States Circuit Court for the Eastern District of Pennsylvania. From this decision an appeal was taken by the Attorney General to the United States Supreme Court, which appeal has been argued and is still under advisement by the court."

A discovery of the tungsten-bearing mineral scheelite in the western part of the Moose river gold district of Nova Scotia is described in the *Report of the Department of Mines* for 1908. The mineral first found was tungstite, or tungstic ocher, in the shape of a boulder. Scheelite float was found in a nearby brook and investigation displayed a belt 200 by 1200 ft. containing in all 14 veins with an aggregate width of about 50 in. Three other tungsten discoveries have been made previously in the province.

Mexican mint reports for the fiscal year, 1907-8 in the *Boletin de Estadistica*, Aug., 1908, show the following: The amount of metal used for coinage was 16,407,978.38 pesos in gold, and 5,834,230.19 in silver; the export was valued as 19,896,879.62 pesos in gold, and 66,545,525 in silver. The sum total reported at the mint during the year was valued at 108,684,613.45 pesos.

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April 24	10,000

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*Illustrated.

The Porphyry Copper Mines

During the last four or five years the mines of copper disseminated in porphyry have been amply discussed. Their fruition has been slow because they have been developed on an unparalleled scale. However, some of them have now become productive, one of them is paying dividends, and we can begin to see more clearly how the estimates are going to be borne out. In the first place let us call attention to the fallacy of referring to these as "low-grade mines." As compared to a mine like the Poderosa, that we mentioned recently, which yields ore of 30 per cent. copper, they are indeed of low grade, but as compared to those of Lake Superior they average well. Their ore is capable of cheap mining; the first metallurgic process to which they are subject, viz., milling, is the cheapest of all methods of treatment, and when their mineral undergoes the more costly smelting, the bulk has been so greatly reduced that the cost referred to the crude ore is not very much. The real low-grade mines are those like the Granby, whereof all the ore must be smelted.

Of the porphyry mines that have reached the productive stage, Nevada Consolidated is the shining light. With respect to grade of the ore, facility of mining, excellence in concentration, and performance of the smelter it appears that the engineering estimates are going to be verified, including that of a production-cost of 7c. per lb. (direct-operating expense). Its neighbor, Cumberland-Ely, is also doing well, but has so much smaller ore reserves that it can hardly be considered in the same class.

At Bingham, the Utah Copper Company has become a large producer, already paying dividends, which will doubtless be increased even at the present price for copper. This company is certainly to be pronounced a success. Its management has always been conservative in its public expression of expectations and what it has indicated has been approximately achieved. Yet, it has probably fallen a little bit short of what was really expected; not as to tonnage of ore, but rather as to cost of production. However, the Utah Copper Company is unquestionably a cheap and profitable producer.

The Boston Consolidated has been greatly disappointed as to the grade of its ore and consequently the cost of production, besides by the beginning of steam-shovel mining at a place where the ore was unexpectedly high in iron. In order to supply the mill it became necessary on the spur of the moment to develop an underground mine. The feat of its management in opening such a mine in a few months so as to produce a large tonnage of ore was a marvel. The Boston Consolidated is a large property, which has a great tonnage of ore of about 1.5 per cent. copper, but it is now estimated that the cost of production will be 10½c. per pound.

Porphyry mines have become the fashion, as witness the numerous recent flotations. To mention some of them there is the Ohio (nearing the productive stage), the Miami (a wonderful development), the Giroux, the Ray Consolidated and adjoining it the Ray Central, and latest of all the Inspiration (near the Miami). In Chile there is the Braden Copper Company. It will be several years before all of these become productive, but sooner or later they are undoubtedly going to swell the production of copper.

The Conservation of Resources

The addresses at the recent meeting of the four engineering societies ought to dispel some of the illusions as to what may be done in the way of conserving our natural resources. Instead of statesmen, writers and dreamers, we had there a gathering of practical engineers. Dr. Douglas effectively punctured the idea that we are wasting our mineral resources by careless mining and smelting, which some conservation commission or amiable bureauocracy is going to show us how to correct. Dr. Raymond with his characteristic pungency pointed out the dangers of legislative conservation, the tendency of governmental agencies to seek additional power, and the bad record of the Federal Government in some things of this character that it has undertaken. Mr. Baker, editor of *Engineering News,* talked with real sense when he pointed out our enormous fire loss as a waste that can and ought to be reduced. This is on the line the JOURNAL has previously argued.

Attention should first of all be directed to make the best use of, and prevent the waste of, property that has been created. Let the propaganda be directed to reduc-

ing the waste by fire, vermin, disease, accidents and general carelessness. The Government itself has an excellent opportunity to lead and show the way by reducing extravagances in its own affairs. Among minor matters it might cease undertaking to teach us how to gasify coal, operate gas engines and burn coal under boilers without smoke, and otherwise multiplying unnecessarily the standard, but long existing, literature of engineering. The matter of economy in production may safely be left to the engineers of the country. Government officials can no more show them how to improve their methods of mining and smelting, extracting coal, etc., than they can teach their grandmothers to suck eggs. However, the movement toward conservation serves a real purpose, that we belittle in no way, by calling the attention of the public to the fact that it is wasteful and that our natural resources are not unlimited.

The Ultimate Consumer

We have been hearing a good deal lately about the "ultimate consumer." The phrase appears to have caught the popular fancy. The ultimate consumer is a good person to bear in mind, but there seems to be more or less doubt as to his connection with the markets. Some seem to think that the only interest of the ultimate consumer is in the prices of such things as he purchases directly, such as tea and coffee and articles of wearing apparel.

It is far from easy to trace to the ultimate consumer the consumption of such an article as copper, which may be sold in the first place to a hydroelectric company. However, no matter how tangled the skein may be, it is certain that in the end the ultimate consumer foots the bill for every article of consumption and that all the revenue that supports our Government, and builds a Panama canal, and carries on other improvements, eventually comes out of his pocket. The ultimate consumer may fancy that he has little or no concern as to a rise in price for a crude staple, like rubber for example, but nevertheless, it affects him sooner or later. Thus, as to rubber, the price of overshoes may remain the same, but the manufacturer will coat them less thickly with gum, they will then wear less long, and in the long run the ultimate consumer will have to buy more of them, which will be an increase in his cost of living.

The Tennessee Purchase

At the annual meeting of the United States Steel Corporation this week, a stockholder brought up in a critical way the purchase of the stock of the Tennessee Coal, Iron and Railroad Company by the Steel Corporation. His criticism was not based upon the policy of acquiring that property, but rather on the point that in doing so the Corporation might be held to have subjected itself to penalties under the Sherman law. This was doubtless inspired by the recent discussions in the United States Senate over the transaction in question, and the action of Mr. Roosevelt in intimating that no attempt would be made to apply that law to this individual case. The report of the Senate committee, which was doubtless prepared chiefly with an eye to political effect, was the moving point.

In his answer to the criticisms in question, Judge Gary stated practically nothing new, unless we may accept as news the statement that the Steel Corporation had been considering such a purchase for some time before it actually took place. That, however, is simply a confirmation of what was previously general report and understanding. Few who had anything approaching to knowledge of the conditions doubted that the ownership of the Tennessee property would eventually gravitate to the Steel Corporation. Doubtless the transaction would have been delayed for some time, had not financial conditions presented the opportunity which they did for the sudden closing of the business.

Judge Gary, in speaking of the transaction, sought to minimize its importance. He stated that it added only 2½ per cent. to the capacity of the Corporation for producing finished steel. This is doubtless true, since the steel output of the Tennessee company had attained only to a small proportion of its total business and was comparatively a new part of that business, but it added largely to the capacity for producing pig iron and at a low rate. The main point in the transaction, however—as was remarked at the time it took place—was the acquisition of the very large reserves of iron ore which were controlled by the company. The Tennessee managers for years had followed the policy of acquiring such reserves, partly in provision for their estimated future needs and partly also to anticipate and prevent the successful organization of a rival company in its own territory. This policy has been successfully carried out, and it was so much in line with that of the Steel Corporation that the opportunity was one not to be neglected. The ore deposits of Alabama are by far the largest existing anywhere outside of the Lake Superior region, and their control prevents the future organization of a strong rival in Southern territory. Doubtless a great industry will in time be built up in Birmingham, as the demand which can be conveniently supplied from that center increases. It will, however, be supplementary to and controlled by the Steel Corporation. At present the Gary plant is the center of new activities and probably Birmingham will have to wait.

THE PRICE PAID for the Raritan refinery by the International Smelting and Refining Company was $6,500,000, part in cash, part in stock. The capacity of the works is 300,000,000 lb. of copper per annum. The cost of building such a works is about $2,250,000, exclusive of the land, which at Perth Amboy is fairly expensive. It is fair to say in this case that $4,000,000 represented profitable contracts, good will, etc. The earning capacity of the works is said to be $1,000,000 per annum, but that seems to be putting it rather high.

THERE ARE MANY mining districts in which water is a costly commodity, where careful means have to be introduced to economize it. One of these is Broken Hill, New South Wales. The article by Mr. Palmer, elsewhere in this issue, gives some remarkable figures respecting small water consumption in mining and milling. At the Junction North mine he has reduced the quantity to 1900 lb. per 2240 lb. of ore, and expects to get down to 950 lb. of water per 2240 lb. of ore.

REPORTS ARE NOW becoming more frequent of copper mines that are being closed to make necessary repairs, or are letting a part of their furnaces go out of blast "while copper continues so low," etc. This manifests the beginning of a natural restriction of production by the elimination of those mines whose cost has been proved to be higher than 13c. per lb. of copper, with little or no prospect of farther economy.

Mining Laws and Lease System in Wisconsin Zinc District

By J. E. Kennedy*

Mining legislation enacted in Wisconsin is decidedly meager. The only laws in the statutes today regulating mining were passed in 1860 and in 1872, when lead ore was practically the only "mineral" mined in the State. Any general terms specifying the number of men required to work, the number of days of work required per year and the amount of rent to be paid to the landowner constitute a good lease. A verbal lease is equally as binding as a written one, which is an exception to the general law that any transfer of interest in land shall be void unless in writing. Furthermore, a verbal lease as well as a written one is transferable to third parties, an instance of which occurred recently at Mifflin, Wis. In the absence of a written lease, the usages and customs among miners govern and the taking of rent by the landowner constitutes renewal of lease. In the State of Illinois, however, a verbal lease is not binding, as was decided a few years ago by a test case.

Rules Governing Mining Rights

The Wisconsin law of 1860 declares that, when there is no contract between the parties or terms established by the landlord to the contrary, the following rules and regulations apply to mining contracts and leases for the digging of ores and minerals:

"(1) No license or lease, verbal or written, made to a miner shall be revocable by the maker thereof after a valuable discovery or prospect has been struck unless the miner shall forfeit his right by negligence such as establishes a forfeiture according to mining usages.

"(2) The discovery of a crevice or range containing ores or minerals shall entitle the discoverer of the ores or minerals pertaining thereto, subject to the rent due his landlord, before as well as after the ores or minerals are separated from the freehold; but such miner shall not be entitled to recover any ores or minerals or the value thereof from a person digging on his range in good faith and known to be mining thereon until he shall have given notice of his claim; and he shall be entitled to the ores or minerals dug after such notice.

"(3) Usages and customs among miners may be proved in explanation of mining contracts to the same extent as usage may be proved in other branches of business."

In the case of Sobey vs. Thomas, 39 *Wis.* 317, it was declared that "the statutes governing the rights of miners apply *only* when there is no contract fixing the rights of the parties." Decision in the case cited also declared that "lease of exclusive right to work a certain range does not convey the exclusive right to work a vein on another portion of said tract, between which and the former no connection exists within the said tract, although, since the lease, a connection between them has been traced by a circuitous course through adjacent land of another person."

Conflicting Claims

In case of conflicting claims, the Wisconsin statutes provide the court with authority to "continue any action to enforce a claim or grant any necessary time for the purpose of allowing parties to prove up their mines or diggings;" in which case the court may appoint a receiver to whom the ores or minerals raised by either party, pending the dispute, shall be delivered, such receiver paying any rent or other necessary expenses therefrom. This law aimed to correct claim-jumping, a common practice in the early days of lead mining. The custom prevailed that the right to mine a certain tract, crevice or range was retained, in the absence of the miner himself, by the presence of his windlass. The claim-jumper had only to substitute his own windlass and display greater physical prowess in order to displace the proper owner.

"A license to mine upon lands is irrevocable after a valuable discovery or prospect has been struck by the licensee, though no actual entry has been made under the lease." Tipping vs. Robbins, 64 *Wis.* 546. Thus, if *A* has obtained license to mine the adjoining lands of *B* and *C* and has made a valuable discovery on the land of *B* his license to mine upon the land of *C* cannot be revoked by *C*.

"A written conveyance of the right to dig for ore on a certain described range does not create a property or estate in the land; it is a mere license to dig and search for the mineral." Gillett vs. Treganza, 6 *Wis.* 342. Therefore, *A* has no interest in ores mined by *B* after *A* has forfeited his rights according to the provisions of his lease or according to the usages and customs among miners.

Lessee's Fraud—Forfeiture of Rights

"Any miner who shall conceal or dispose of any ores or minerals for the purpose of defrauding his lessor of his rent or who shall neglect to pay any rent on ores or minerals raised by him for three days after the notice thereof and claim of such rent, shall forfeit all right to his mines, diggings or range; and his landlord, after such concealment or after three days have expired from the time of demanding rent, may proceed against him to recover possession of the mines or diggings before a justice of the peace as in the case of a tenant holding over after the termination of his lease as provided by these statutes; and in case a miner shall neglect to work his mines or diggings according to the usages of miners, without reasonable excuse, he shall likewise forfeit his mines or diggings and his landlord may proceed against him in like manner to recover possession of the same." *Wis. Stat.* 1860 *Sec.* 5 *ch.* 260 and 1872 *sec.* 4 *ch.* 117.

Right of Waterway

Sections 1650-53 of the Revised Statutes of Wisconsin grant the right to every corporation, company or person engaged in mining to conduct water away from their shafts or levels, over or below the surface of the land of adjoining landowners. Commissioners are to be appointed whenever the parties in dispute cannot agree as to damages. Appeal may be taken from decision of commissioners to the Circuit Court and land may be taken after the award has been allowed and filed.

Safety Restrictions

No laws regulating mining methods nor aiming to secure greater safety are in force in Wisconsin. A bill creating the office of mine inspector was introduced in the legislature at Madison four years ago, but failed to become a law.

General Provisions of Leases

There are only one or two instances where verbal leases are in force in Wisconsin at the present time. The ordinary written lease is permanent provided certain conditions are fulfilled by the lessee. The customary rent or royalty paid today in the Wisconsin zinc district is one-tenth of the gross receipts from ores mined. A few leases require one-ninth and a limited number require only one-twelfth. The usual rent paid for lead diggings in the early days was one-eighth; often, however, a provision was made to the effect that one-eighth rent be paid on ore found above water and one-tenth on that found below the water level. A few leases today require one-eighth rent to be paid on lead and one-tenth on zinc ore. Except in one or two instances the lessee pays the cost of hauling of ore to railway, ore buyers in this district usually purchasing the ore f.o.b. cars. It is the exception, rather than the rule, that a cash bonus is paid to landowners to obtain a lease. Most of the leases in force require the lessee to work at least four men nine months or more each year.

*Platteville, Wis.

According to the *Torg. Prom Gazetta*, there were 64 dredges at work in the Urals and the Yenisseik district, Russia, in 1908. Of these 25 were in the Urals. Fairly detailed reports have been received of the working of 46 of the dredges, the production of which was 52,467 oz. of gold.

Views, Suggestions and Experiences of Readers

Comments on Questions Arising in Technical Practice and Debatable Points Suggested by Articles in the Journal

CORRESPONDENCE AND DISCUSSION

Sampling by Machine

I have read with interest the recent articles in the JOURNAL under the above heading and note that the opinion seems to prevail that our present methods and machines either are not absolutely reliable or that mill men have not yet made sufficiently accurate experiments to teach them definitely whether the methods or machines or both are at fault.

The greatest inaccuracies are liable to occur in the coarsest sizes. The reasons for this are clearly stated by Mr. Church. (1) An inherent defect in all automatic, mechanical sampling machines treating mixed coarse and fine ore due to the fact that as the sampler scoop comes under the stream of ore a certain period of time ensues before there is sufficient opening, between the near side of the sampling scoop and the far side of the ore spout, for the coarse ore to pass into the scoop, and when the scoop is passing out of the ore stream the diminishing space between the far side of the scoop and the near side of the ore spout also prevents the coarse ore from entering the sampler, yet fine ore is passing into the scoop during the whole period; (2) the ore in sliding down chutes or passing through the samplers is retarded but this retardation is not the same on fines and coarse so that there is a tendency for the two to separate and introduce another error.

These two arguments seem logical and appear to prove that in sampling ores where the coarse and fine sizes are liable to carry different values, we cannot be certain that the sample obtained is representative of the lot of ore handled. The remedies so far proposed deal with the method of taking the sample, the frequency of cut and the proper handling between machines; but it seems to me that the greatest error is due to the construction of the sampling machines now on the market, and the discussion of a new design might lead to the result we are trying to obtain.

Some time ago I was called upon to design a concentrating plant for the separation of stibnite from a quartz and slate gangue. Owing to the greater brittleness and softness of the stibnite compared with the quartz, the fine ore had a much higher mineral content than the coarse material. The first crushing was to 2½ in. and the sampling would have to be done after this crushing. Realizing the inaccuracies which were liable to obtain with any of the samplers then on the market due to the first reason above mentioned I set out to design a new machine. My efforts resulted in a very simple machine. The idea is so simple that possibly it may have been used before but as far as I know it is original.

The machine consists of two endless sprocket chains carried on sprocket wheels. On these chains are carried one or more buckets attached to the chain as is usual on steel-pan conveyers. These buckets, which it should be remembered are few in number, can be dumped at any point by means of a tripper. On the return or under side of the conveyer the bucket is inverted so that material spilling from above could not enter and vitiate the sample. The buckets can be of sufficient capacity to suit the plant, but are made a little larger than necessary so as to prevent spilling. By varying the speed of travel of the chain and the number of buckets the proper frequency of cut can be obtained.

The travel of the buckets is in the same direction as the flow of the ore in the ore chute above it. The buckets are made wider than the ore chute to prevent the ore spilling. On the front of the bucket is a hinged lip extending the width of the bucket and ½ in. longer than the largest size. As the travel of the chain brings the bucket under the ore spout two flat guides engage the lip and force it down against the top of the bucket, putting two springs in compression and forming a cover over the front of the bucket for a distance of 3 in. in its length and its entire width. The guides stop at the end of the ore spout.

As the front of the bucket passes the end of the ore chute into the ore stream, the lip forms a flat extension of the bottom of the ore chute until released from the guides, when it is instantly forced into an almost vertical position and the stream of ore flows into the bucket. The lip helps to prevent spilling. It is readily apparent that both coarse and fine will be caught by the bucket in the same proportion as they existed in the ore stream. It is also apparent that as the bucket leaves the ore stream it will cut coarse and fine alike.

The sample is held compactly in the bucket and can be delivered into an ore bin by a very short spout. This would eliminate the distance the ore has to fall through such samples as the Vezin or Snyder, and the overturning of the bucket would mix coarse and fine so thoroughly that they could not separate in the short space to the ore bin or next crusher. The effect of retardation would, therefore, be of little importance.

This device need take up no more headroom than other samplers, would take no more power, has the advantage of cheaper first cost and the chain can be of any length desired, transporting the sample to any convenient place for further treatment. The device is not patented and I offer it for discussion.

D. F. HALEY.

West Gore, Hants Co., Nova Scotia.

Direct vs. Alternating Current for Mine Work

In the JOURNAL of March 6, 1909, there is an abstract of a paper on "The Use of Electricity as Applied to Coal Mining," by W. B. Spellmire, of the Allis-Chalmers Company, in which, among other matters, the question of direct *vs.* alternating currents for mining work is discussed. Mr. Spellmire appears to be of the opinion that alternating currents are to have it all their own way in mining work. I think there is considerable doubt as to that. It is quite true that for some time past three-phase alternating currents have been making steady way in mines, for two reasons: the absence of the commutator necessary with continuous-current motors, and the greater ease with which large quantities of power can be transmitted over long distances.

During the last 30 years, which really covers the period of the practical application of electricity to general commercial life, the alternating current has had a checkered career. During at least two important portions of that period, the alternating current has apparently been the form of electricity that was applicable to anything and everything, and then shortly afterward the alternating current has been in disgrace and risen again, Phœnix-like, a short time later.

I think the later and more important development of the use of alternating current is due to America and the great use that has been made there of very high pressures to deliver large quantities of power over long distances. On this side, when we installed electric trams many years after you had had them running, we followed your lead exactly in pressure and everything else. There are signs, however, that the continuous current may recover its position. M. Thury has been working

quietly at Geneva and has done much useful work with continuous currents at very high pressures. He has constructed a continuous-current machine to work at 25,000 volts.

M. Thury has returned to the arrangement that was suggested for long-distance transmission in the very early days of electricity, viz., the connecting of generators in series, instead of in parallel. In this method additional power is obtained when required by connecting additional machines in series. On light load under this system one generator, for example, will be running, and as more power is required, the single machine running may be speeded up until it is at its maximum. Then a second machine is switched *into* the circuit and adds its pressure, which again may be low at first and gradually increased as the demand for power increases. This may be followed by a third machine, and so on.

Consumption is supplied in exactly the same way, by switching motors *into* the circuit, instead of switching them *across* the circuit. The arrangement, of course, requires some knowledge and experience, but with the general spread of knowledge of electricity this should not be a serious matter. Any kind of power, for any purpose, can be obtained at any part of a mine, for instance, by switching in a motor and causing it to drive a generator that furnishes the current in the required form. Where the motor can be applied to perform the actual work itself it is switched in and the pressure it is taking regulated, instead of the current.

This arrangement has several important advantages. One is that it requires only two cables instead of three, as required with three-phase apparatus which constitute the greater number of alternating-current power plants. There is also avoided the troublesome conditions that arise with alternating currents owing to the development and changes of magnetism in the neighborhood of the cables. I think it would be at least as simple when once the arrangement is understood, to work in mines with continuous currents on these lines as with the parallel system.

I note also that Mr. Spellmire states that direct-current generators cannot be built to operate at higher than 600 volts. On this side continuous-current generators have already been built up to 3000 volts, and I think if a sufficient demand arose, with improved methods of manufacture, improved materials of insultation, etc., higher voltages could be obtained. The great trouble in producing either continuous-current generators, or continuous-current motors at high pressures is the insulation of the commutator. With high pressures the commutator assumes very large proportions and the insulation becomes a serious matter.

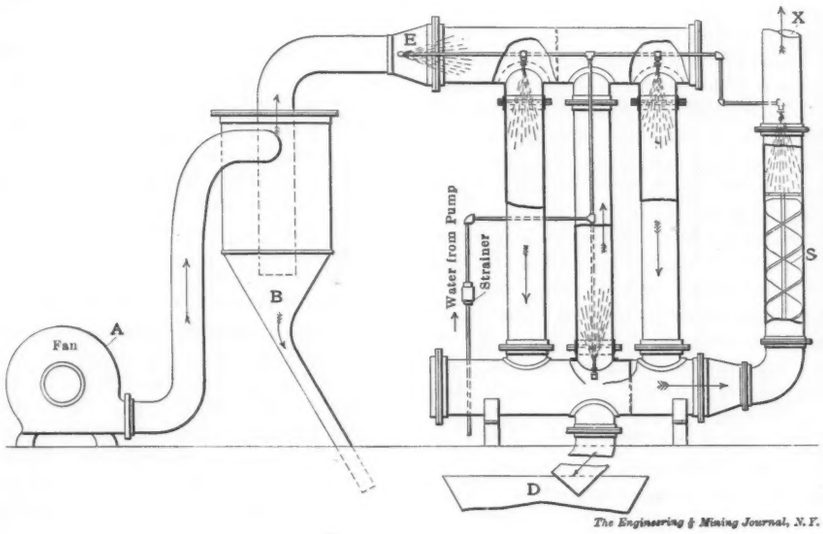
SYDNEY F. WALKER.

Bath, England, April 8, 1909.

Collecting Precious Metal Dust

Various means have been devised for collecting or reclaiming the precious metal dust in mills where the ores are crushed dry and a description of the accompanying illustration may, therefore, be of interest to those engaged in this particular branch of metallurgical work. In the illustration, *A* represents one of the fans exhausting the dust from the mill or elsewhere, and discharging the same through pipes to the air separator *B*.

The heavier portion as it enters this separator drops to the bottom and then spouts to the proper machine for further treatment. The separator *B*, does its work satisfactorily as far as it goes, but only takes care of the coarser and heavier particles and without further apparatus much valuable dust would go to waste. The dust collected in *B* contains some of the richest portions of the ore, occasionally weighing as much as 135 lb. per cubic foot.



COLLECTOR FOR PRECIOUS METAL DUST

The dust collector proper is made of metals suitable to the requirements and is equipped with a number of spray nozzles of special construction through which water under about 50 pounds pressure is forced. The ore dust is forced in by the blower and enters at *E*. In passing up and down the different compartments it is moistened by the water discharged through the spray nozzles, which contain a spiral that gives the water a rotary motion. This has the effect that on entering, the water is thrown into a very fine spray which completely fills the different dust collector pipes in which nozzles are installed and as the dust passes through the spray, it is collected and drops to the bottom whence it is flushed to the sealed tank *D*.

When this material is to be subsequently concentrated on vanners or tables, sufficient water is added in the steel tank *D*, to make a wet pulp that will easily run to the table or vanner floor. To be sure that none of the valuable dust escapes with the surplus air at the outlet *X*, a sheet-iron spiral *S*, is installed as shown in the illustration. Above this spiral is also another spraying nozzle. These spray nozzles and dust collectors are manufactured by the Schutte & Koerting Company, of Philadelphia, Penn.

Coal Mining as an Investment

The editorial on "Coal Mining as an Investment" in the JOURNAL of March 27, 1909, was read with great pleasure because the public has been served with articles in the magazines, such as the *World's Work*, etc., warning them that a mining investment is purely speculative and, therefore, unsafe; that on investment that pays more than 5 or 6 per cent. per annum is a safe investment.

In a section like the South, where opportunities are many and capital scarce, the rate of interest paid by many legitimate and perfectly safe investments is much higher than 5 or 6 per cent., and the business of mining when properly conducted will pay at least 20 per cent. upon the investment.

It will not be long until even in this section coal land will be so high in price that it will be impossible to buy it without, in a large measure, discounting the future, but to those who have bought or will buy now the investment should be very attractive, and to those who undertake this problem in an intelligent way, namely, by obtaining competent advice and assistance, there need be no risk at all in the undertaking of mining coal.

E. M. JONES.

Chattanooga, Tenn., April 12, 1909.

Mining Conditions in Turkey

SPECIAL CORRESPONDENCE

The momentous political change that has recently taken place in Turkey invites attention to the mineral resources of that country, which, in spite of their acknowledged abundance, have in the past been but poorly exploited. Corrupt officialdom, unfavorable mining laws and the absence of roads have all contributed to prevent mining from becoming a prosperous industry. Except at mines situated near the coast, the necessary machinery for working could not be installed, owing to transport difficulties. The introduction of electrical machinery has been prohibited, except under very special circumstances, while the admission of explosives has always been a matter of the greatest difficulty and expense. Under these conditions it is not to be wondered at that capitalists have been shy of investing in mining undertakings.

Under the altered form of government reforms may be looked for which cannot fail to lead to a rapid development of the country's minerals. Regular and reliable statistics of the mineral production are unfortunately not available. In Cuinet's great work there is much valuable information, but the book is somewhat out of date. From time to time British consular reports have described the mines of certain districts. One of the most important of these is that published in 1903, entitled, "Mining Industries and Forestry in Turkey," which deals with the districts of Smyrna, Aleppo, Damascus, Beyrout and the Lebanon, Adana, Erzerum, Trebizond and Uskub. The general tone of these reports is pessimistic, and little encouragement is given to capitalists to take up mines, owing to the unfavorable conditions prevailing. As an example of these reports, that by Consul Barnham, upon the mines of the Aleppo Vilaget, may be quoted: "It is no grateful task," he says, to write of mines and mining operations in this district, for although the mineral wealth is great, I do not remember that any concession worth mentioning has even been granted. . . . . The minerals of which the locality is more or less defined are coal, iron, silver, copper, chrome ore, boracite, antimony, sulphur, fuller's earth and petroleum."

At one of the iron mines in his district the ore was carried on horseback, a day's journey, to be smelted at a place where timber was available, in spite of the fact that there was an occurrence of coal in the immediate neighborhood of the mine.

A RICH DISTRICT

Another consular report, that by the British consul at Uskub in Macedonia, quoted in Noll Buxton's paper, "Balkan Geography and Balkan Railways," in the September number of the Royal Geographical Society's *Journal* of this year, is written in the same strain. He says: "The province of Kossovo possesses all the latent possibilities of very real prosperity, but political conditions at present frighten capitalists and paralyze industry. There are mines of every description in the province and the mineral wealth is said to be comparable with that of the Transvaal, but owing to the great difficulties of transport and the insecurity of the country, few mines have been exploited up to the present, but concessions are now being more eagerly sought after. Gold, silver, copper, iron, chrome ore, lead, antimony and manganese, besides coal (lignite) have all been found in considerable quantities and fresh discoveries of lodes are continually being made. A British company will this year start working a silver-lead mine near Kratova, which is believed to have very good prospects; it was worked by the ancient Greeks and is one of the mines mentioned by Herodotus. The chrome mines near Kalkandelen cannot yet enter into competition with the New Caledonian chrome mines, owing to the excessively costly transport of the mineral to the coast. Coal mines are plentiful, as at Kalkandelen, Prisren, Yeniky, etc., but the quality does not appear to be very satisfactory."

NO DEPARTMENT OF MINES

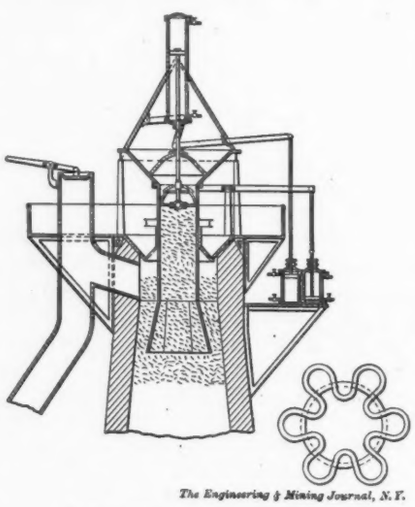
One reason for the general ignorance and uncertainty as to the extent of the mineral resources is that there is no government geological survey. That the country contains many valuable mineral deposits is, however, indisputable. There have been considerable exports of chrome iron ore, of emery and of borax, while antimony, copper, lead, coal and manganese have also been produced on a smaller scale. As regards the mining law, mining concessions are held either under an Imperial concession or *firman*, or under a prospecting license. The formalities necessary for obtaining a *firman* are very severe, and as it is only with this title that the rights to a mining property are secure, it is not surprising that capitalists have avoided the country.

A report by the German Consul General at Constantinople, published in the *Oestereichishe Monatschrift für der Orient*, May, 1905, "Das Minenwesen in der Turkei," contains some interesting criticism, mostly of an unfavorable character, on the mining law of Turkey, and gives reasons for the backward condition of the mining industry.

Whether the new regime will alter all this remains to be seen. There cannot, however, be any doubt that under a liberal and well administered mining law, capital for developing mineral property in Turkey would flow into the country to the great advantage of the national finances. Taking into consideration the urgent need there is of increased revenue, it seems scarcely possible that this most promising method of strengthening the finances will be neglected. A point in favor of the expansion of mining enterprise is the railway development that has taken place in recent times, both in European and Asiatic Turkey. The country is rapidly becoming more accessible and the work of exploration much simplified. Security of tenure and the removal of official obstruction are the principal needs of the country to encourage mining enterprise. What is required is the formation of a strong department of mines, with a competent staff of mining engineers; and what is now a neglected industry, may soon become of great commercial importance.

A Proposed Blast Furnace

Joseph E. Johnson, Longdale, Va., proposes (U. S. patent 906,717, Dec. 15, 1908) a blast furnace having at the top of the stack above the ore hopper a mantle



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THE JOHNSON BLAST FURNACE

carrying a conical fuel hopper ending in a vertical cylindrical chute flaring at the bottom and designed to feed the coke or fuel separate from the stock and to have it descend in a column inside of that formed by the stock. Above the mantle and fuel hopper is mounted a steam cylinder with a pusher which fits into the cylindrical body of the fuel chute, and presses on the upper surface of the fuel. The lower portion of the fuel chute is a frustum of a fluted cone whereby the fuel is discharged in a column having flutes within the body of the ore or stock.

The *Queen. Gov. Min. Journ.* places the total gold output of New South Wales to the end of 1908 at 13,258,793 oz. fine. The yield recorded for 1908 was 223,792 ounces.

Patents Relating To Mining and Metallurgy

A Selected and Classified List of New Inventions Described during the Past Month in the Publications of the Patent Offices

UNITED STATES AND BRITISH PATENTS

A copy of the specifications of any of these patents issued by the United States Patent Office will be mailed by THE ENGINEERING AND MINING JOURNAL upon the receipt of 25 cents. British patents are supplied at 40 cents. In ordering specifications, correspondents are requested to give the number, name of inventor and date of issue.

ALUMINUM

CASTINGS—Mold for Making Castings of Aluminum and Aluminum Alloys. Earl Blough, Parnassus, Penn., assignor to Aluminum Company of America, Pittsburg, Penn., a Corporation of Pennsylvania. (U. S. Nos. 915,727 and 915,728; Mar. 23, 1909.)

COAL AND COKE

COAL-CUTTING MACHINES — Improvements in, or Relating to Chain Coal-Cutting Machines. Herbert Clough, Sheffield, and William C. Mountain, Gateshead, Eng. (Brit. No. 4966 of 1908.)

COKE—Improved Means for Preventing the Breakage of Coke Discharged from Coke-Ovens. Brodie Cochrane, Gosforth, and Robert Peel, New Brancepeth Colliery, Eng. (Brit. No. 19,280 of 1908.)

COKE-OVENS—Improvements in and Relating to the Building of Horizontal Flued Coke-Ovens. Arnold Lupton, London, and Thomas H. Riley, Sheffield, Eng. (Brit. No. 8926 of 1908.)

COKE-OVENS—Improvements in, or Connected with Charging Apparatus for Coke-Ovens. The Coke-Ovens and By-Products Co., Ltd., and Stephen Newcombe, London. (Brit. No. 6224 of 1908.)

COKE-OVENS—Improvements in, or Connected with Coke-Ovens. The Coke Ovens and By-Products Company, Ltd., and Stephen N. Wellington, London. (Brit. No. 6047 of 1908.)

COKE-OVENS—Improvements in, or Connected With Coke Ovens. Harold W. Seymour, Leeds, Eng. (Brit. No. 1409 of 1908.)

COPPER

DESULPHURIZING—Apparatus for Desulphurizing and Sintering Ores. Arthur S. Dwight, Joliet, Ill., and Richard L. Lloyd, Cananea, Mexico, assignors to Fred Bennitt, trustee, Joliet, Ill. (U. S. No. 916,395; Mar. 23, 1909.)

ROASTING—Apparatus for Roasting and Sintering Ores. Arthur S. Dwight, Joliet, Ill., and Richard L. Lloyd, New York, N. Y., assignors to Fred Bennitt, trustee, Joliet, Ill. (U. S. No. 916,394; Mar. 23, 1909.)

ROASTING—Process of Roasting and Sintering Ore. Arthur S. Dwight, Joliet, Ill., assignor to Fred Bennitt, trustee, Joliet, Ill. (U. S. Nos. 916,396 and 916,397; Mar. 23, 1909.)

GOLD AND SILVER

CYANIDATION — Improvements in Apparatus for Separating Cyanide, Alkaline and Other Solutions from Slimes, Sands and the Like. Communicated from Innes, Proctor & Hayles, Tarkwa, Gold Coast, West Africa. (Brit. No. 11,008 of 1908.)

PLACER MINING—Apparatus for Mining Gold at the Bottoms of Flowing Streams. Leander F. Gilman, Sacramento, Cal. (U. S. No. 916,859; Mar. 30, 1909.)

IRON AND STEEL

DRY-AIR BLAST—Improvements in Drying Blast for Metallurgical Furnaces. Frank W. Harbord, London. (Brit. No. 4424 of 1908.)

HARDENING AND TEMPERING—Composition of Matter to be Employed for Hardening and Tempering Steel. Barnabas J. Casterline, San Diego, Cal. (Brit. No. 3652 of 1908.)

HARDENING AND TEMPERING—Process of Hardening and Tempering Steel. Barnabas J. Casterline, San Diego, Cal. (Brit. No. 3651 of 1908.)

MANUFACTURE—Direct Process of Manufacturing Iron and Steel. Thomas J. Heskett, Brunswick, and Montague Moore, Melbourne, Victoria, Australia. (U. S. No. 917,475; Apr. 6, 1909.)

TIN

DETINNING — Process for Preparing, Smelting and Utilizing Various Products Containing Tin, Particularly the Metallic Sponge and Slime Obtained in the Electrolytic Removal of Tin from Tinplate Scrap. Hans Rennicke, Rheinau, Germany. (Brit. No. 16,428 of 1908.)

MINING—GENERAL

BLASTING—Improvements in and Relating to Blasting Fuses with Double Action. Jean Harle, Rouen, France. (Brit. No. 16,774 of 1908.)

COMPRESSING AIR—A New or Improved System of and Improvements in, or Connected with Means for Compressing Air for Use in Subterranean Mines. Samuel M. Mavor, Mile-End, Glasgow, Scotland. (Brit. No. 3038 of 1908.)

COMPRESSING AIR—Method or Process of Compressing Air. William K. Richardson, Leavenworth, Kans. (U. S. No. 916,019; Mar. 23, 1909.)

HAULAGE—Improvements Relating to the Electrical Operation of Haulage and Winding Gear. Henry A. Mavor and Mavor & Coulson, Ltd., Mile-End, Glasgow, Scotland. (Brit. No. 1450 of 1908.)

RESCUE WORK—Improvements in Means Adapted for the Assistance of Miners Entombed in Cases of Disaster in Coal Pits, Mines and Subterranean Passages. John S. Hastie, London. (Brit. No. 6496 of 1908.)

ORE DRESSING

CONCENTRATOR — Mineral-Concentrator. Charles O. Michaelsen, Omaha, Neb. (U. S. No. 917,337; April 6, 1909.)

CONCENTRATOR-TABLE SUPPORT. William L. Card and Frank S. Card, Denver, Colo. (U. S. No. 917,247; Apr. 6, 1909.)

CRUSHING—Improvements in Machines for Crushing or Disintegrating Ore and Other Substances. Frederick T. Watts, Bulawayo, Rhodesia, South Africa. (Brit. No. 12,676 of 1908.)

GRINDING MACHINERY—Improvements in Machinery for Grinding or Crushing Ore, Rock, Cement and the Like. David Honeywood and Garratt Payne, London. (Brit. No. 25,497 of 1907.)

GRINDING MACHINERY—Improvements in, or Relating to Grinding or Crushing Machinery. George Elliott and George Oxley & Sons, Sheffield, Eng. (Brit. No. 4607 of 1908.)

ORE-CONCENTRATOR. Samuel K. Behrend, Denver, Colo. (U. S. No. 916,257; Mar. 23, 1909.)

SEPARATION—Improvements in Means for Separating Comminuted Ores or Other Solid Matter from Liquids. Alexander J. Arbuckle, Belgravia, Transvaal. (Brit. No. 17,756 of 1908.)

SEPARATOR—Centrifugal Ore-Separator. Philip F. Peck, Chicago, Ill. (U. S. No. 917,120, 917,121, 917,122 and 917,123; Apr. 6, 1909.)

METALLURGY—GENERAL

CALCINING, DESULPHURIZING, AGGLOMERATING AND SINTERING ORES and the Like. Francis D. Weeks, Salida, Colo., assignor to Ohio and Colorado Smelting and Refining Company, New York, N. Y., a Corporation of Colorado. (U. S. No. 916,903; Mar. 30, 1909.)

MINING MACHINERY AND APPARATUS

AERIAL TRAMWAY. William S. La Shells, Berkeley, Cal., assignor to Klamath River Gold Mining Company, Benicia, Cal., a Corporation of California. (U. S. No. 916,335; Mar. 23, 1909.)

BLASTING — Electrical Shot-Firing Machine for Mines. Walter B. McLarty, Wilburton, Okla., assignor of one-half to Jeff T. Boucher, Wilburton, Okla. (U. S. No. 916,476; Mar. 30, 1909.)

BRAKING APPARATUS—Improved Construction of Apparatus for Braking or Spragging Mining Trams, Street Trams, Road and Other Vehicles. John A. Noel, Cardiff, Wales. (Brit. No. 23,155 of 1908.)

CONVEYERS—Improvements in Conveyers Specially Applicable for Transporting Coal or Other Minerals and Constructed With or Without Perforated Plates, Bars, or Grids, for Grading the Coal or Other Minerals. Cuthbert Burnett, Durham, Eng. (Brit. No. 7369 of 1908.)

MINE-CAR STOP — Automatic Mine-Car Stop. Uhel U. Carr, Pittsburg, Penn. (U. S. No. 917,540; Apr. 6, 1909.)

MINE-DOOR-OPERATING DEVICE. John M. Sausser, Osnaburg, Ohio. (U. S. No. 916,027; Mar. 23, 1909.)

PUMPS—Improvements in, or Relating to Centrifugal Pumps for Delivering Liquids. James T. Rossiter, Chiswick, Middlesex, Eng. (Brit. No. 24,499 of 1908.)

PUMPS—Improvements Relating to Rotary Pumps. Horace M. Hodgson, London and the Bryan Donkin Company, Ltd., Chesterfield, Eng. (Brit. No. 16,098 of 1908.)

ROCK-DRILL—Internal-Combustion Rock-Drill. Lewis L. Scott, Joplin, Mo. (U. S. No. 915,893; Mar. 23, 1909.)

SAFETY APPLIANCES—Improvements in Safety Appliances for Mines. Samuel G. Bennett, Chesterfield, Eng. (Brit. No. 2889 of 1908.)

SAFETY APPLIANCES—Improvements in Safety Appliances for Removing Mine Props. Reginald Higginbottom, Thurnscoe, and Owen Murphy, Goldthorpe, Eng. (Brit. No. 6539 of 1908.)

SAFETY LAMP—An Improved Miners' Safety Lamp. Harry B. Buckley, Batley, Eng. (Brit. No. 10,371 of 1908.)

SAFETY LAMPS—Improvements in, or Connected with Miners' Safety Lamps. Harry B. Buckley, Batley, Eng. (Brit. No. 10,372 of 1908.)

SAFETY LAMPS—Improvements in, or Relating to Brushes for Cleaning the Gauzes of Miners' Safety Lamps. John C. Best, Morley, Eng. (Brit. No. 13,510 of 1908.)

SAFETY LAMPS—Novel or Improved Glasses for Miners' Safety Lamps. John T. Stobbs. Stoke-on-Trent, Eng. (Brit. No. 7546 of 1908.)

METALLURGICAL MACHINERY AND APPARATUS

FURNACES—Improvements in Furnaces. Marcus Ruthenburg, Lockport, N. Y. (Brit. No. 12,408 of 1908.)

METALLURGICAL FURNACES—Improvements in Metallurgical Furnaces. Louis S. Hughes, Joplin, Mo. (Brit. No. 16,521 of 1908.)

RABBLES—Improvements in Rabbles for Ore-Roasting Furnaces. Arthur V. Leggo, St. Kilda, Victoria, Aust. (Brit. No. 19,469 of 1908.)

RETORT-FURNACE — Improvements Pertaining to the Firing of Retort or Muffle Furnaces by Means of Producer Gas. Ernst Schmatolla, Berlin, S. W., Germany. (Brit. No. 10,155 of 1908.)

REVERBERATORY FURNACES—Improvements in, or Relating to Reverberatory and Like Furnaces. Communicated from Ernst Schmatolla, Berlin. (Brit. No. 3394 of 1908.)

REVERBERATORY FURNACES—Improvements in Reverberatory Smelting Furnaces. Alva D. Lee, Gila Bend, Ariz. (Brit. No. 11,259 of 1908.)

SMELTER—ORE-SMELTER. Ezra A. Mathers, Philadelphia, Penn., assignor of one-half to Daniel H. Harner, Philadelphia, Penn. (U. S. No. 916,176; Mar. 23, 1909.)

Personals

Mining and metallurgical engineers are invited to keep THE ENGINEERING AND MINING JOURNAL informed of their movements and appointments.

Etienne A. Ritter is examining mining properties at Red Cliff, Colorado.

A. E. Drucker is making a study of the ore treatment in the Kolar goldfield, Mysore, India.

H. T. Pemberton, general manager of the Bartlett mines, Gowganda, has gone to New York.

James B. Davies has resigned his position as superintendent of the Plymouth Coal Company.

Henry Watson, chemist and metallurgist for Goldsmith Brothers Smelting and Refining Company, has gone to Europe.

Frederick H. Morley left Denver April 15, for Prescott, Ariz., to inspect mining property in the Bradshaw mountains.

George D. Reid, of Denver, Colo., is engaged in the examination of mining properties in the Seven Devils district of Idaho.

William Henry Keller, has opened an office in Charleston, W. Va., as consulting electrical engineer in mining practice and equipment.

John B. Hobson has returned to Victoria, B. C., after having spent the winter in California. He will shortly proceed to Cariboo.

John T. Fuller, general manager of the Arkansas Diamond Company, of Little Rock and Murfreesboro, Ark., is in New York, buying machinery.

D. W. Brunton, Denver, Colo., is now in New York City on business and will sail for Europe on April 24. He expects to be absent about six weeks.

J. W. Skeele, general sales agent of the Lehigh Valley Coal Company, has been elected vice-president of the company. He will continue in charge of the sales department.

James P. Walsh has been elected vice-president of the Pittsburg Coal Company, in place of W. R. Woodford, resigned. Mr. Walsh has been connected with the company since its organization.

D. C. Thomas has resigned his position as a district general superintendent of the Pittsburg Coal Company, and has been appointed general superintendent of the United Coal Company.

Dr. Milton L. Hersey, of Montreal, has returned from Germany, where he went in connection with the sampling of 100 tons of Crown Reserve silver ore purchased by the German government.

Ivan E. Goodwin has removed from Rapid City, S. D., to Seattle, Wash., where he has opened an office, in partnership with C. E. Bogardus, for testing ores and engineering materials.

Robert H. Engle, formerly with the Trenton Smelting and Refining Company, is now at 649 Hamilton avenue, Trenton, N. J., where he has opened an experimental laboratory.

J. A. Garcia has been appointed general superintendent of the Brazil Block Coal Company in charge of operating and engineering departments in Illinois, and the Clinton district of Indiana.

Theodore Gross has been appointed resident manager for the United States and Mexico, of the London Venture Corporation, Ltd., and will have his office in the City Investing building, 165 Broadway, New York.

Dr. W. F. King, Canadian astronomer and boundary commissioner, has left Ottawa, for Washington, to arrange with Dr. O. H. Teddman, American boundary commissioner, for the resumption of boundary survey work.

Horace G. Nichols, manager of the Ymir mine, British Columbia, has arranged to have his new slimes-treating process used in connection with the stamp mill being installed at the Jewel gold mine, Boundary district of British Columbia.

Paul S. Couldrey, who excepting during an interval spent in Western Australia, has been in charge since 1902 of the mines at Rossland, B. C., of Le Roi No. 2, Ltd., of London, has been notified by cable from London, that his services are required in another field.

Rector L. Lee, who has been in Peru during the last year, as assistant superintendent at the Peruvian Mining, Smelting and Refining Company's smelter, at Rio Blanco, has returned to the United States on account of the closing of that plant. His address will be Provo, Utah.

Obituary

George Nissen died suddenly in New York, April 15, aged 62 years. He was born in Hamburg, Germany, and came to New York in 1867. Since 1882 he had been connected with the metal trade in New York, for some years as an independent operator, and later as a member of the Pope Metals Company.

Amzi Lorenzo Barber died at Ardsley, N. Y., April 17, aged 64 years. Mr. Barber is best known for his work in starting and building up the asphalt industry in this country. At different times he operated largely in this country, in Trinidad and in Venezuela. At the time of his death he was president of the A. L. Barber Asphalt Company.

Societies and Technical Schools

Massachusetts Institute of Technology—On April 14 the Mining Engineering Society listened to a lecture on rescue work by W. E. Mingramm, of the Draeger Oxygen Apparatus Company, of New York. It was practically illustrated by sets of apparatus.

Michigan College of Mines—The annual class-day exercises, closing the 23d year of the college, were held at the college gymnasium, Houghton, Mich., on April 13. The address was delivered by Isham Randolph, of Chicago, who took "Reminiscences of Forty Years of Engineering Service" as his subject.

Montana Society of Engineers—At the meeting in Butte, March 13, a letter from a member was read on "Mining Operations in Korea and China," giving a clear account of labor and financial conditions in those regions, and caused much discussion and comment. The letter was accompanied by many photographs.

American Electrochemical Society—At the annual meeting at Niagara Falls, May 6-8, the first day will be devoted to the electrometallurgy of iron and steel. Papers are expected from Robert Turnbull, Paul Girod, Dr. A. Kjellin, Ernesto Stassano, Remo Catanio, Ch. A. Keller, Gustav Gin, Henry D. Hibbard, F. A. J. Fitzgerald, P. McC. Bennie and Jos. W. Richards.

Salt Lake City Young Men's Christian Association—The Chemistry and Metallurgy class arranged this spring for a series of lectures by competent speakers. The list for April included the following: "Geology of Utah", by Fred J. Pack; "The Bingham Mines," by Louis Gates; "Park City Mines", by P. L. Williams, Jr.; "Milling and Concentrating." The May program is as follows: 4. "Copper Smelting", by E. P. Matthewson; 11. "Lead Smelting", by A. H. Richards; 18. "Mining Law", by Frank B. Stephens; 25. "Mining Stocks", by W. H. Tibbals.

American Society of Mechanical Engineers—The society will hold its spring meeting in Washington, May 4-7. Professional sessions will be held at which papers on the conveying of materials, gas-power engineering, steam turbines, the specific volume of saturated steam, oil-well pumping and various other subjects will be discussed. During the convention President Taft will hold a reception for the members at the White House. The War Department will give a special exhibition drill of the troops at Fort Myer. At the same time, if the conditions are favorable, an ascension of a dirigible balloon will be made and probably also that of an aëroplane. An address will be given by Rear-Admiral Melville, past-president of the society, and former engineer-in-chief of the navy, the subject being "The Engineer in the Navy." This address will be made the occasion for the presentation to the National Gallery of a portrait of Rear-Admiral Melville presented by friends and admirers. It will be received for the National Gallery by Dr. C. D. Walcott, secretary of the Smithsonian Institution.

Special Correspondence from Mining Centers

News of the Industry Reported by Special Representatives at San Francisco, Butte, Denver, Goldfield, Toronto, Mexico, London, Johannesburg

REVIEWS OF IMPORTANT EVENTS

San Francisco

April 16—Some legal tangles are developing in the sale of the Keane Wonder mine, Inyo county. The property was to be sold this week to satisfy a mortgage given to the Frances Mohawk Mining Company to secure a loan of $200,000. A suit has been filed by a stockholder charging the management with fraud and asking an accounting for the benefit of the stockholders and forbidding the foreclosure sale.

A suit is being tried in Shasta county to foreclose a mortgage on the Brunswick mine near French Gulch. B. F. Rossi, of that place sold the mine to H. D. Lacey, of New York for $60,000, of which $40,000 was paid in cash and a mortgage was given for the balance. Lacey resists the foreclosure of this mortgage, alleging that his agents, who bought the mine for him, charged $20,000 commission illegally. The case has not yet been decided.

Mining developments in Nevada county have been quite exciting of late, several properties showing up extremely rich ore. From the Central Consolidated, rich ore is being taken out at a depth of 400 ft. The channel in the Jenny Lind gravel mine has been cut and is found to be satisfactory. The Pittsburg Potosi-Gold Flat property is being opened near Nevada City and the old Nichols mine is being reopened. The old Ben Franklin mine is yielding good ore.

The Alaska mine at Pike City, Sierra county, is well known as the wettest quartz mine in the State. The mine has produced phenomenally rich ore at times, but again and again have the levels been flooded, and even when the men could work, it has been a difficult job to keep the water within bounds. Finally a great flood closed the mine for years. About four years ago new people undertook to unwater the mine with new pumps, electric power, etc., and it was only last week that the job was entirely completed after many difficulties and interruptions. They have resumed sinking the shaft at a point about 30 ft. below the 440 level, which was the bottom when the mine was finally drained.

During the last month there was quite a boom in the Humbug district of Siskiyou county, four miles west of Yreka, where the richness of the ore in the Inyo mine first called special attention to the district. A hundred or more claims were located within a few weeks, and now comes the discovery that the railroad company owns most of the ground. Some of the claims located are on open ground, but railroad ownership of the rest of the section will prevent further locating of claims and further active development. There has been no deep mining done in that region, though a few mines have been yielding good ore. That from the Inyo claim is rich and is being sacked and shipped.

There is considerable activity at present in the section of the Argus range, Inyo county, below Wilson cañon. Rich gold strikes have been made near the towns of Custer and Monster, lying close together. Some of the ore is free-milling, but some will have to be smelted. The old mill from Wilson cañon is being taken in and will soon start up. In this camp there is plenty of water near the surface and timber is found within easy distance. There are now several hundred men in the district, and numbers of prospectors are going in.

Up in Plumas county a lot of miners are doing prospecting under difficulties. In the Brush creek section, sloping down to the north fork of the Feather river, about eight miles from Crescent, in Indian valley, a miner a short time since found rich specimen ore. He took some of it to Reno, Nev., where it was exhibited in a show window. This attracted so much attention that mining men in automobiles left for Plumas county and bonded the claims. Now a number of people are trying to locate claims on top of 12 ft. of snow.

Butte

April 16—President Anderson, of the Panhandle smelter, at Ponderay, now closed down as the result of action instituted against the company by the Greenough brothers, has recently given out a statement to the effect that the alleged over-issue of stock, which was the basis for the suit, is a mistake. President Anderson states that about 800,000 shares of the company's stock were sent on from Winnipeg, Canada, for transfer and new certificates were issued in lieu thereof, but by some misunderstanding the old stock was held by attorney E. C. MacDonald instead of being turned in for cancellation.

George W. Craddock has brought suit in the district court at Missoula against the Buffalo Mining Company for the sum of $134,500. The action is brought to recover the value of 134,500 shares of the company's stock of which plaintiff claims to be the owner. The plaintiff claims that the company refuses to issue the stock to him and he is suing for its market value.

The State railroad commission is now in session at Helena and has under consideration complaints of coal operators against the rates established by the railways in the State. The operators in the Bear creek district are the principal complainants, maintaining that the rates which they are compelled to pay prohibit them from competing with the operators in the Red Lodge district. The railroads have raised the point that the commission has no jurisdiction to establish joint rates and this phase of the situation may find its way into the courts, should the commission overrule this contention.

The Amalgamated Copper Company has recently declared a quarterly 50c. dividend, payable May 31, and the Boston & Montana company a quarterly dividend of $2 and $1 extra per share. Much interest has been manifested in the recent rise of quotations on the stock of the East Butte company. It is rumored that the company, through William A. Paine, has secured an option on 700,000 shares of the treasury stock of the Pittsmont Copper Company, and also an option on a large portion of the 300,000 shares now outstanding. The Pittsmont property, with its operating smelter and its ground developed to a depth of 1500 ft., would enable the East Butte Company to become a large producer.

Denver

April 16—In the Cripple Creek district the Vindicator Consolidated Gold Mining Company, whose dividends paid to date amount to $1,980,000, has decided to pass the next quarterly dividend owing to the fact that they have passed through a zone of unusually low-grade ore, and that a payment had to be made of nearly $12,000 in taxes. It is stated, however, that the ore is increasing in value again, and that the usual dividend will probably be paid next quarter. The report of the Doctor-Jack Pot Company gives the total receipts of the company at $42,824, and net profit over disbursements $33,093. The annual report of the Findley Consolidated Mining Company gives total receipts for the year at $188,868; net profits over disbursements, $37,403. It was stated that owing to the installation of improved mining machinery the cost of mining the ore was reduced from $14 to $9 per ton. The annual report of the Work company shows a total of $49,302 received, and an expenditure of $56,841, making a loss for the year ending March 31 of $7538. The Mary McKinney mine, under lease to the

Western Investment Company, is credited with a production in March of 25 cars of ore of a gross bullion value of $24,000.

The Portland Gold Mining Company has paid its second quarterly dividend for 1909 of 3c. per share, amounting to $90,000, making a total received by the stockholders to date of $8,317,080. News comes to hand that in prospecting the old workings at the 300 level of the Jerry Johnson, an orebody has been opened which for 30 ft. in width is being shipped as broken, the values running from $20 to $30 in carload lots, 12 cars having been sent out during the first half of April.

In Leadville, the Yak tunnel has penetrated the Fortune ground in South Evans gulch, and will soon pass the New Monarch and Cleveland shafts, and will drain the country adjoining it. It is stated that in the South Evans Gulch district there is great activity, and a number of properties are shipping; among them the Valley shaft is credited with a steady production of 40 tons of lead sulphides per diem, and the Favorite and Tenderfoot, south of Cleveland, are both shipping regularly. The greatest benefit that this tunnel enterprise will confer on Leadville and the mining interests of the State generally, is the draining of the Resurrection mine and the opening up of the immense low-grade orebodies which had to be abandoned some time ago.

Salt Lake City

April 17—The stock of the Utah Copper Company has recently been listed on the New York Stock Exchange. The annual report for the year ending Dec. 31, 1908, states the gross copper production for that year was 43,873,918 lb. The average price applying to sales of copper for the 18 months preceding was 13.2c., while the average cost per pound was 8.85c., this price being based upon the net pounds of copper resulting after smelter deductions and including all expenses of transportation, refining and disposition of metal. During the period covered by the report, $4,005,018 were spent on improvements at the Garfield mill and power plant.

Quarters are being prepared for the new Utah Stock and Mining Exchange in the Atlas block, and it is expected that the first call will be made before the end of the month. The following governing board has been announced: David Keith, president, David Evans, B. F. Grant, Ezra Thompson, Windsor V. Rice, J. D. Murdoch and F. J. Westcott, of Salt Lake; John P. Creer, of Payson, and Joseph Berry, of Provo.

The Alta district is to resume shipping this week. The roads are being cleared of snow and as soon as they are ready for steady hauling the Columbus Consolidated will send out a heavy tonnage from the big orebody recently discovered on the fourth level below the tunnel. Manager Jacobson states that this orebody will average 30 ft. in width and is believed from present development to be of shipping grade for over 200 feet.

Goldfield, Nevada

April 13—The production of the Goldfield mines for the week ending April 10 was as follows: Consolidated 3850 tons, valued at $173,250; Combination 630 tons, at $28,350; Florence 850 tons, at $21,250; handled by Western Ore Purchasing Company 850 tons, at $255,000; Nevada Reduction Company 750 tons, at $30,000; total production valued at $507,850.

Indianapolis

April 19—Representatives of the Rock Island Coal Company, have consummated a deal by which 30 coal mines and a large acreage of coal lands in Indiana and Illinois, separated by the Wabash river, are under its control.

The Dering merger, which was in the Rock Island interests, several weeks ago offered the Dering 14 mines and some others to the Steel Corporation, and the sale was about to be perfected when, it is said, H. C. Frick overruled his associates and declared the deal off. This led to the appointment of a receiver for the Dering company. The receiver, however, discovered that the Steel Corporation was withholding payment of $213,000 for coal sold to the Illinois Steel Company, which the court, during the past week, ordered the two steel companies to pay.

It is now predicted that, as a result of the deal just perfected for its land and mines, the Dering receivership will be dissolved. The deal includes the leasing of the Dering mines to the Brazil Block Coal Company on terms that will give better value to the Dering stock and bonds.

Jackson Dering has opened offices in the Old Colony building, Chicago, and will be in charge of the general business of the combine now controlled by the Rock Island people.

Toronto

April 17—The Board of Conciliation, appointed under the Lemieux act to adjust the differences between the Dominion Coal Company and its employees has reported to the Department of Labor at Ottawa. The difficulty is due to the existence of two rival labor organizations, the Provincial Workmen's Association, a purely Canadian body, and the United Mine Workers, an international organization. It was asserted by the employees, and admitted by the company, that it had discriminated against the members of the United Mine Workers, and refused to receive committees from that body. A majority report, signed by Judge Wallace, of Halifax, held that the company was justified in refusing to recognize international unionism, and could not be expected to deal with two unions at one time. The report goes fully into the question of international unionism, contending that the United Mine Workers are practically a foreign organization, as the bulk of its members and the principal executive officials are resident in the United States. It is urged that American labor difficulties might lead to complications in Canada. If, through labor troubles in United States, a market were opened up there for Nova Scotia coal, pressure would be brought to bear on the Nova Scotia miners to prevent the export of coal. Strong exception was taken to a provision of the constitution, under which the officials may, at any time order a suspension of work in any district, if it is considered in the interests of the union—a power which no foreign body should be able to exercise over the industrial interests of Nova Scotia. The coal company is, therefore, considered as fully justified in refusing to recognize a union that could exercise so dangerous a power.

Daniel McDougall, representing the employees on the board, submitted a minority report condemning the company for discriminating against and refusing to recognize the United Mine Workers union, insisting that it was not a foreign, but an international body, and urging its recognition by the company.

The effect of the investigation and the disagreement of the board will probably be to intensify rather than to reconcile the differences between the company and its workmen.

Mexico

April 16—It is generally believed that the Mexican government will back up the long proposed railroad projected from Gutierrez through Sombrerete and Chalchiutes to Durango. The road is very much needed by the mining camps in western Zacatecas. This road was projected by the Robert S. Towne interests a year ago. The National Railways (the merger) has authorized the expenditure of 12,000,000 pesos on improving the Central division and widening the Interoceanic between Mexico City and Vera Cruz to standard gage. The Mexican Southern, an English company, is completing the recently acquired Oaxaca-Taviche road and extending the Tlalacula branch from Oaxaca, also recently acquired, to Tula with the expressed intention of extending it to the Tehuantepec line. The Pan-American line from the Tehuantepec road along the coast to the Guatemalan boundary has recently passed to the control of the United Fruit Company interests, already owners of railroads and mines in Costa Rica and Guatamala. The Oaxaca Coal and Iron Company, concessionaires of coal and iron lands in southern Mexico, has a project for a railroad from Puebla to the Pacific and it is expected

that European capital will be secured to carry out the plan. An English syndicate is considering the proposed road from Comacho to the Mazapil copper district and then east to connect with the National line. This project has a guarantee from the state of Zacatecas. These railroads together with the other projects in northern Mexico, and the extensive Harriman extensions in Sonora and on the West Coast, promise to have a wide influence on the general business conditions of Mexico, and particularly to extend greatly the available fields for mining.

The Federal government is inquiring into the question of local support in the building of wagon roads and it is likely that some general policy to better the present deplorable condition in this regard will result. In many cases the local authorities not only do not contribute to the building of needed roads and their maintenance, but assert the right to collect a toll on such roads built by private interests. A notable State road has just been completed from the end of the Central line at Balsas, Guerrero, to Chilpancingo. This is over a rugged country and the new road is now opened for traffic. Automobiles will be used by the Oaxaca Coal and Iron Company to reach Tlaxalco, Oaxaca. The road is being repaired and the former two-days' trip on horseback will be cut to a few hours. Generally the transportation conditions of the country are improving, although slowly.

After lengthy negotiations, two of Col. W. C. Greene's standard enterprises have been acquired by a strong Canadian company headed by Dr. F. S. Pearson, of Toronto. They are the Sierra Madre and Pacific railroad running, southwest from Ciudad Juarez, to Nuevas Casas Grandes, and the Sierra Madre Land and Lumber Company, holding a vast tract of timber land in western Chihuahua. The Cole-Ryan interests were concerned in the railroad property by reason of a loan against it, and it was thought that for a time the property would fall to their hands. It is not given out on what terms the properties were acquired by the new owners. A bond issue of $3,000,000 is solicited in Scotland for extensions and improvements and it is announced that the new company will not only extend the Sierra Madre road to connect with the Chihuahua & Pacific and then to the Pacific coast, but will also be interested in the projected road from Chihuahua to Monclova, Coah. The name of the new company is the Mexico Northwestern Railway Company organized under the laws of Canada, capital $40,000,000.

London

April 15—The Palmarejo & Mexican Goldfields Company, Ltd., is raising fresh capital in order to erect a new mill and to carry on development work on lines laid down by E. T. McCarthy, who was recently called in to advise the directors. The old plant, which was giving a poor extraction, has been shut down. It is anticipated that with a modern plant the extraction can be raised from 62 to over 90 per cent., and that the costs can be cut down nearly one-half. The new expenditure required, according to Mr. McCarthy, is £116,000. A sum, however, exceeding this is to be raised, namely, £175,000 by the creation of 700,000 new shares at 5s. each from which it appears that the company has debts to liquidate.

Recent development work in the mine has been satisfactory and there is a large quantity of ore in sight, estimated at 1,435,000 tons containing on an average 18 oz. silver. It is estimated that ore worth 13 oz. of silver will yield a fair profit. It has been decided to erect the new mill on the Zapote site and not at Palmarejo, on account of the abundance of water at the former place. The arrival of the Kansas City & Orient railway within easy distance of the company's property will benefit its development and allow work to be started on some of the outlying mines upon which prospecting work has given promising results.

The report of the Anglo-French Exploration Company, Ltd., has been issued. This company is largely interested in the eastern section of the Witwatersrand goldfield and has benefited by the favorable developments of the district. The largest shareholdings of the company are in the East Rand Proprietary mines, the New Kleinfontein Company, and the Van Ryn Deep Company, all of which have recently appreciated in value. As evidence of the improved state of affairs in the mining industry of the Transvaal, it may be noticed that a valuation of the holdings of the company at the end of the year, together with the cash or equivalent of cash, showed a surplus over the paid-up capital of the company of about £333,000, as compared with a surplus of about £63,000 at the corresponding period of the previous year.

A dividend of 10 per cent. on the ordinary shares in addition to that on the preference shares was declared, and a balance of £42,475 was carried forward to this year. The directors have appointed Edward J. Way consulting engineer to the company to date from Oct. 1 last.

The report draws attention to the steady progress that has been made during the last two years and anticipates a large increase in the gold production and the profits in the future. The recent development work in the deepest mines has been most encouraging, and a considerable reduction in the cost of working through consolidation of mines and through the greater efficiency of labor has been secured, so that the anticipations of prosperity in the future seem justified. If there is a weak spot in the situation it is with regard to the adequate supply of native labor to meet the heavy demands that the opening of new mines and the extensions of old ones will make. But so far the natives have responded to an unexpected degree to the calls made and while this question is, no doubt, a factor upon which future expansion chiefly depends, there are at the present time no signs of a labor famine.

Johannesburg

The stope-drill competition, organized by the Chamber of Mines and the Transvaal government, has already been fruitful of promising results. The surface elimination trials commenced at the University College on Feb. 14, and nine types of machine have already been tested. The speed honors have so far fallen to a German hammer-drill, called the Westphalia, which is automatic and very light (65 lb., including its independent cradle). On actual drilling time, one test with this drill showed 4.996 in. per minute, and another 3.421 in. per minute, or on total time, 2.675 and 1.944 in., respectively. The Westphalia is not economical in air consumption, using 224 and 299 cu.ft. per foot drilled in the two tests, as compared with 193 cu.ft. by the Flottmann, another hammer-drill which did very good work. The average speed of the Flottmann was 4 in. per minute on drilling time, and 2.18 in. on total. These preliminary trials, to be followed in due course of time by the critical test of durability in mine work, have proved that a great mechanical advance has been made during the past year by the inventors and manufacturers of small drills. The Konomax, Waugh and Chersen, of which great things are expected, have not yet been tested.

The question of maintaining gold reserves, for the purpose of equalizing monthly output declarations, has already been discussed in the JOURNAL from different standpoints. The firm adopting the practice most freely has been the Wernher-Beit-Eckstein, so that the defense made by Lionel Phillips, head of the group in South Africa, in his presidential address before the Chamber of Mines, bears special significance. He claimed that the reserve was created "so that the declaration of a regular monthly return, based upon the value of ore reserves, according to assay plans, could be maintained. The practice of keeping reserve gold under such conditions is highly desirable, as it tends to present speculative fluctuations in the value of securities, which annoy the genuine investor; and it certainly shields directors from the unpleasant accusations incident upon rises and falls in market quotations." Mr. Phillips pointed out, however, that in large producers, drawing ore from a great many points, the yields average themselves, and that in future the retention of reserve gold may thus become less necessary.

Mining News from All Parts of the World

New Enterprises, Installations of New Machinery, Development of Mines and Transfers of Property Reported by Special Correspondents

THE CURRENT HISTORY OF MINING

Alabama

Southern Steel Company—This company's properties were sold at bankrupt sale at Birmingham, April 12. They were bought for $5,111,000 by W. W. Miller, of New York, acting for the reorganization committee. Notice was filed that the purchasers must care for pending litigation against the company.

Alaska

VALDEZ

Kennecott Mines—A snowslide occurred recently killing three men, among them being James Gray, a mining engineer, from England.

Copper River Railroad—Cordova is the center of much activity, as the railroad is open to the rapids on Copper river, and trains are carrying immense quantities of supplies to the front, which are being freighted up the river. River steamers made in Seattle and shipped knocked down have been shipped north for operation and will connect with the railroad.

Bonanza—The Morgan-Guggenheim syndicate, which controlled the Bonanza mine in Alaska under the name of Alaskan Copper and Coal Company has acquired minority holdings of H. O. Havemeyer estate, Norman Schulz and others. The Morgan-Guggenheim syndicate is now building the Copper River railroad in Alaska, which will reach this property.

Arizona

GILA COUNTY

Arizona Copper—A new floor is being placed in the concentrator preparatory to the installation of Deister tables.

Inspiration—Capitalization, $10,000,000; par value $10. Development work on Clipper, Caraval and Americus claims, 2300 ft. Property consists of 23 claims, or about 300 acres. Adjoins Miami on the west. A low-grade copper property, and ore is said to be ideal for concentrating. Wm. B. Thompson, president; Geo. E. Gunn, general manager, and Henry Krumb, consulting engineer.

Superior & Boston—The capital is to be increased from $2,000,000 to $2,500,000, par value $10; this is to add to the working capital, and pay for the Collins-Doyle group of claims.

Eureka—At the 600 level a crosscut encountered 10 ft. of good copper ore.

GRAHAM COUNTY

Shannon—The Greenlee group of claims is to be worked under option by the Shannon company.

PIMA COUNTY

Helvetia—C. C. Prindle, president, states that the daily shipments to Globe are 50 tons of 5-per cent. copper ore.

PINAL COUNTY

Imperial—About 800 tons of ore are being shipped daily to the Southern Arizona Smelting Company.

Arkansas

PKIE COUNTY

Arkansas Diamond Company—The property is near Murfreesboro. Fifteen men are employed in proving the ground. An experimental plant will be installed to handle 150 loads of ore per day. Orders are being placed for machinery and a large plant will be erected within the next 12 months.

California

AMADOR COUNTY

Eclipse Extension and Last Chance—Sold by the sheriff for delinquent taxes to A. V. Mandenhall, of Oakland.

BUTTE COUNTY

Butte Creek Consolidated Dredging Company—The new dredge has been completed, the power line connected and work has commenced.

CALAVERAS COUNTY

Challenge Group—This group of mines, comprising the Wabash, Fraction and Challenge, near Mokelumne Hill, owned by Casey, Davidson & Robinson, is now to be developed. During assessment work a blind vein was discovered which carries good values.

Flour Sack—A rich pocket of gold-bearing quartz and "black metal" was encountered recently.

PLUMAS COUNTY

Northern California & Nevada Consolidated Mining Company—J. D. Murray, one of the owners, has made a discovery of high-grade ore in a wide vein. Preparations are being made to install the first unit of a large mill.

SHASTA COUNTY

The Yuba Construction company has launched the hull of a new dredge at Horsetown, 10 miles from Redding. There have been three dredges built at this place, two of which were burned and the third was taken apart to be rebuilt. The new dredge will shortly be put in operation.

Carnegie Mine Company—The Clipper group of copper mines, near Copley, has been sold to this San Francisco company. The group includes the Clipper, Old Judge, Little Blossom and Ridge mines in Backbone district.

Mammoth—The smeltery is running at full capacity, treating about 1700 tons of charge per day, and producing copper at the rate of about 30,000,000 lb. per annum.

SIERRA COUNTY

Sixteen-to-One—The ore continues to be abnormally rich. The extent of the pay shoot is still unknown. E. H. Wilson is manager.

SISKIYOU COUNTY

At the Gardner & Weed four crews are at work in the upper and lower mines at Quartz Valley. Wright & Fletcher, of Oro Fino, are running their hydraulic mines full blast with an abundance of water.

Modoc—The recent find in this mine has attracted considerable attention to that part of the county. A number of the locations there are now being prospected.

TRINITY COUNTY

Headlight—This old mine, near Trinity Center, has been sold to New York men at a stated price of $100,000; a partial payment has been made.

Enterprise—An important strike is reported.

Oriole—A. L. Paulsen has purchased the remaining half interest in this mine, on Indian creek, he already owning the other half.

TUOLUMNE COUNTY

U. S. Grant—Walter Cole is superintendent. A 1000-ft. tunnel is being run to tap the vein.

App—One of the best shoots of ore ever found in this old mine at Quartz has been found on the 1300 level. The ledge is about 13 ft. wide and some of it is specimen rock. The mine is owned by W. A. Nevills.

Black Oak—The mill at Soulshyville, which has been running on old dumps, has been closed down temporarily. Good paying ore has recently been found in the

old workings which have been unwatered by S. A. Knapp and associates.

TULARE COUNTY

Green Butte—Development work is now going on in this copper property, two miles east of Portersville. Some ore will shortly be shipped to the Selby smelter.

YUBA COUNTY

Boston Consolidated—This company has been organized to work the claims on the Whittle place at Brown's Valley, adjoining the Dannenbroge and Pennsylvania mines. W. H. Allison, Charles Himes, C. L. Maseman and Louis Pierrat are the incorporators.

Colorado

LAKE COUNTY—LEADVILLE

New Monarch—The work of sinking and cutting stations on the Cleveland shaft is nearly completed. The stations are 9x12 ft., in one of which a pumping plant has been erected while the other will be used for unloading and hoisting. Regular shipments continue from the Winnie shaft.

Carbonate Hill—During the winter months, the Morning and Evening Stars and the Waterloo were the most active producers. The Yankee Doodle, Big Chief and Excelsior will soon begin active operations, work already being in progress on the Pyrennes property.

Sugar Loaf—The success which the Dinero and Bartlett tunnels have attained has marked the Sugar Loaf district as one of the most promising sections. Both of these properties are ore-producing. As soon as the weather permits work will be resumed on several other properties in this locality.

Coronado—Regular shipments of a good grade of iron ore are being made from the new portions of the Coronado property. A large body of this ore is in sight, and it contains a fair amount of silver.

Favorite—This property in the South Evans district is at present undergoing extensive development work, and shipments will soon be renewed.

Valley—A good grade of lead ore is being taken from this shaft. The gold content in the ore makes this locality practically independent of a fluctuating metal market. The drainage facilities afforded by the Yak tunnel promise to make the South Evans gulch one of the most active sections of the Leadville district.

OURAY COUNTY

Camp Bird—A strike of high-grade ore was recently made on this property, a 3-ft. vein being cut that was officially reported as assaying between $200 and $300 per ton.

TELLER COUNTY

Work—At the recent annual meeting the following directors were elected: J. A. Connell, Marion Stark, W. R. Watterton, E. E. Quentin and H. C. Hall. The mine is being operated by leasers. The company owns the Little Clara claim which some months ago produced a large amount of ore. Marion Stark, of Colorado Springs, is manager of the property.

Gold Dollar Consolidated—A dividend of ½c. per share amounting to $12,500, has been declared. The mine is under lease to the Union Leasing Company, which is shipping a large amount of ore. The property is situated on the east slope of Beacon hill.

Idaho

SHOSHONE COUNTY

Ajax—Lead carbonate and galena deposits were encountered recently.

Indiana

CLAY COUNTY

The joint meeting of the miners and operators of the Block coalfield was held April 15. The meeting adjourned to a future date without accomplishing much. There are a number of matters of considerable importance to be settled. The charge against several mine bosses with having sold rooms to miners is one of the things causing trouble. The feeling against the foreigners is strong because it is claimed they have been favored by the bosses in the distribution of the work. President Morganthaler, of the miners' union, has called out the men in the Mary mine of the Otto Creek Coal Company, where trouble arose over installing machines.

GREENE COUNTY

Black Hawk Coal Company—This company's operations at Jasonville have been resumed after a three months shut down during which time repairs and improvements were made. The company announces that the orders received and booked are sufficient to keep the mine running for a year.

Shirley Hill—Mine No. 1, near Linton, has closed down until the demand for coal gets better. This mine has been worked more than any other mine in the Linton district for the past year.

VANDERBURG COUNTY

Coroner Laval has returned a verdict in the case of the mine explosion at the Sunnyside mine on March 20, in which six miners lost their lives. The coroner held that the explosion was caused by a "windy" or "illegal" shot. This, with coal gas and dust blown into the air was responsible for the loss of life.

Speck Mining Company—This company composed of 100 citizens of Evansville, has elected the following officers: President, Philip Speck; secretary-treasurer, William Swarmstedt; directors Peter Walrath; J. S. Beeler, M. M. Hags; M. L. Buckley and H. W. Flentke. The capitalization is $1,000,000.

VERMILLION COUNTY

The Dering mines in the Clinton field have been at work steadily this week whereas they had worked very irregularly before the change in management. The outlook in the Clinton field for steady operation at all the mines is regarded as the brightest in two years. There are three companies in this field—the Brazil Block, the Oak Hill and the Clinton Coal companies. The Clinton company operates three Crown Hill mines, employing 800 men, and none of these mines has been idle more than five days since last December. This company has recently bought large tracts of coal land adjoining the present holdings, and plans are being made to sink one or two new shafts soon. The Oak Hill company has let a contract to Charles Walter & Co., to sink one of its mines to the third or lower vein. The mines of this company have been operated a little over half-time. The Derings have six mines in operation in this field.

Louisiana

The Standard Oil Company, of Louisiana has been granted a charter in Louisiana with a capital of $5,000,000. It will construct a $2,000,000 refinery and run pipe-lines from Louisiana and Texas and compete with the Guffey Company in shiping southern oil north.

Maryland

ALLEGANY COUNTY

Consolidation Coal Company—At Ocean mine No. 2 recently, 17 cars broke loose from a trip which was being hauled up the slope. The cars jumped the track and knocked out several sets of timbers, causing a bad cave, which blocked the slope for several days.

Michigan

COPPER

Elm River—Crosscutting continues both ways from the bottom of the exploratory shaft, at a depth of 200 ft. from the surface. Some copper-bearing formations have been exposed, but nothing of a commercial value.

Oneca—Preparations are being made to begin diamond-drill operations as soon as the weather conditions will permit. Drilling will be started on line with the strike recently made at the New Baltic property.

New Baltic—Two drilling outfits are being erected to put down a series of holes. Trenching has been temporarily suspended, due to the spring breakup, and will be resumed as soon as the surface water disappears. A favorable-looking

formation was opened recently and is believed to be the northern extension of the Baltic lode.

Franklin—Report for the year ending Dec. 31, 1908, shows: Assets, $420,754; liabilities, $127,698; balance of assets, $293,056. Surplus, $192,261, as compared with a deficit of $42,180 for 1907. Rock stamped, 342,596 tons; refined copper per ton of rock stamped, 10.82 lb.; refined copper produced, 3,703,421 lb. Total cost per ton of rock stamped, $1.573.

Mohawk—Report for year ending Dec. 31, 1908, shows total working expenses at the mine including smelting, freight and general expenses, $1,085,590; construction, $21,796; mining profit, $298,574. Total assets, $712,332; liabilities, $127,732. Rock stamped, 685,823 tons; refined copper produced, 10,295,881 lb.; yield, 15.01 lb. per ton of rock; cost per pound of refined copper, 9.605c. at the mine; smelting, etc., 0.938c. per lb. Total cost, 10.543c. per pound.

IRON—MARQUETTE RANGE

Ohio—This mine, owned by the Buffalo & Susquehanna Company, was the first mine on the range to begin shipments this season. A cargo was shipped to the Marquette docks last week.

IRON—MENOMINEE RANGE

Calumet—Work has been suspended for the present, and the men have been transferred elsewhere.

Dober—Arrangements have been made for increased shipments this season. This is an Oliver Iron Company mine, in the Stambaugh district.

Verona—A number of men are employed in exploration and several bodies of ore have been found.

Victoria—M. A. Hanna & Co., of Cleveland, have acquired this mine from the International Harvester Company. The property is to be opened and thoroughly tested.

Minnesota

IRON—MESABI RANGE

Canisteo—At this mine, on the western end of the range, progress is being made with the large washing and concentrating plant. The plant is near Trout lake and will handle ore from the Holman and Walker as well as the Canisteo. At the last-named mine stripping is being done.

Hull-Rust—The work of stripping on this mine near Hibbing is making steady progress. It is claimed that the orebody already proved is the largest on the range.

Lincoln—Work for the season is well started on this mine at Virginia, owned by the Jones & Laughlin Steel Company.

Longyear Lake—This mine, owned by the Euclid Iron Company, is in the Chisholm district. It is operated partly by shaft and partly by open pit.

Silver—M. A. Hanna & Co., owners, have the stripping well advanced, and so much of the orebody is uncovered that large shipments will be made this season.

IRON—VERMILION RANGE

Section 30—This mine near Ely is now in the hands of George A. St. Clair, of Duluth, and operations will be resumed to test its value. There are two shafts, one down 300 ft. and the other 700 ft. Both are to be sunk deeper.

Montana

BUTTE DISTRICT

Butte Coalition—The Rarus and Tramway mines are steadily increasing their output and have recently shipped as high as 1700 tons a day. The great amount of development work which has been carried on in the Tramway and Minnie Healy mines for the past year has reached a stage where the orebodies are now ready for working and it is expected that there will be a gradual increase in production from now on. The Tramway shaft has passed the 1700-ft. mark and a crosscut is now being driven from the Rarus to connect the two mines at that depth.

Nevada

ESMERALDA COUNTY

Goldfield Consolidated—A large orebody was encountered last week on the Lucky Boy claim assays from which average $75 per ton across its entire width of 10 ft. The ore was encountered in a drift on the 300-ft. level of the Red Top company workings. Shipments from the Hampton stope were resumed on April 14 at the rate of one carload per day.

ESMERALDA COUNTY—BLAIR

Nevada Bay State Oil Company—The drill is now working at a depth of about 950 ft. A stratum of black sand heavily impregnated with oil was encountered at 915 ft., but the formation directly beneath was so hard that operations were suspended pending the arrival of heavier casing.

ESMERALDA COUNTY—BONNIE CLARE

Bonnie Clare Mining and Milling Company—This company has undergone a reorganization, and plans are being made to again operate the property.

ESMERALDA COUNTY—RAWHIDE

Rawhide Queen and Coalition Estates—Malcolm Macdonald and his assistants expect to complete the examination of these properties next week.

NYE COUNTY—BULLFROG

Diamond Queen—A 30-ton shipment was made from the Culver-Hargrave lease last week which was settled for at the rate of $95 per ton. The company is at present driving a crosscut from the 100-ft. level of the new shaft to tap the orebody 75 ft. distant.

Montgomery Shoshone—This property shipped 15,000 oz. of bullion April 6, making a total production for March of 29,000 ounces.

Aurora Bullfrog—Ore that assays $20 per ton was encountered in the shaft. A station will be cut at the 300-ft. level and laterals run to pick up the vein at that depth.

NYE COUNTY—PIONEER

Bullfrog Pioneer Leasing Company—Ore running from $12 to $15 per ton was encountered in what is known as the Office tunnel, 500 ft. from the main shaft. The ore bins at Springdale, the railroad shipping point, are now completed, and with the new hoist in commission a production of 100 tons per day will be attempted.

Rickard Lease—The new 25-h.p. hoist was placed in commission last week, and the three-drill compressor will be in operation by the middle of the month. Good pannings are reported in the bottom of the shaft, now 75 ft. deep. Work will continue in the shaft at the rate of 4 ft. per day.

Mayflower—Favorable reports come from both the mine and mill. Four power drills are being added to the underground equipment. A system of development work has been adopted which will take six to eight months to carry through. The property has been surveyed and divided into lease blocks.

NYE COUNTY—JOHNNIE

Johnnie Consolidated—The output for March was $16,000. The showing on the 700-ft. level is reported as better than anything heretofore found on the property, one shoot of ore being 18 ft. wide.

NYE COUNTY—TONOPAH

Tonopah Extension—A continuation of the work on the 400- and 700-ft. levels is the only development work going on in this property at present. The west drift on the South vein shows a decided improvement and bunches of good ore are exposed in the breast. The work now being performed is the blocking out of a large tonnage to be available on completion of the mill.

MacNamara—The shaft was sunk 28 ft. during the past week, being now 696 ft. deep. Five feet of good milling ore are exposed on the 200-ft. level in the stope from the west drift. On the 275-ft. level, two stopes have been connected exposing an average width of 7 ft. of good ore for a distance of 50 ft. Shipments for the week amounted to 350 tons.

Midway—Work was resumed early last week after a shutdown of five days caused by an accident to the boiler. Several stringers of ore have been encountered on

the 635-ft. level, which are being drifted upon with encouraging results.

West End—A large amount of work is being done on the 200- and 400-ft. levels, and several good oreshoots have been opened. Two hundred tons of ore were shipped during the week.

WHITE PINE COUNTY

Cumberland-Ely—Production in March was 1,450,000 lb.; shipments, 1,636,171 lb. Recent figures are said to show a cost of production of 7.85c. per lb., delivered at New York, crediting railroad and smelter earnings against copper cost.

Nevada Consolidated—Production in March was 1,750,000 lb.; shipments, 2,168,088 lb. The net cost of copper delivered at New York is figured recently at 7.03c. per lb., crediting railroad and smelter earnings against copper cost. The Steptoe Valley smelting works now has three reverberatory furnaces in operation.

New Mexico

GRANT COUNTY

A strike of high-grade ore was made on the Ridgewood claim, about a mile and a half southeast of Sylvanite, and adjoining the Gold Hill property on the south. The strike was made practically at the surface. The rich streak is from 12 to 15 in. thick. Sylvanite has been quiet for the last few weeks, and this new find has created a good deal of excitement. About half a ton of this ore has been sacked for shipment, and men are to be put to work at once saving all the high-grade.

SOCORRO COUNTY

Billings Smelter—J. A. Lowe, manager of the Pan-American Federal Smelting and Refining Company, states that the old smelter will be remodeled and enlarged to 750 tons per day.

Oregon

JACKSON COUNTY

Cascade Coal—A bed of bituminous coal, reported to be of good size and quality, has been encountered in the Sunnyside mine on the Broadbent property, near Medford.

BAKER COUNTY

Humboldt—A mill is being erected by John Arthur, lessee of this property in the Mormon basin mining district.

Pine Creek—All the old claims are operating and several new placers have been opened up in the Burnt creek district.

Pennsylvania

ANTHRACITE COAL

North Mahanoy Colliery—All efforts to extinguish the fire which recently started in this colliery, near Pottsville, have failed. In order to prevent the fire from spreading to the adjoining St. Nicholas and Shenandoah collieries, it has been decided to wall up the workings and fill the mine with water. The colliery is owned by the Reading company.

South Dakota

LAWRENCE COUNTY

Elliptic—The development work is being watched with much interest on account of the exploration of the deep formations. It has installed an excellent new diamond-drilling equipment to replace that hitherto in use.

Globe and Gilt Edge Maid—On April 6 these mining properties were sold at sheriff's sale. The former mill is a metallurgical fiasco; the latter a dry crushing mill well situated to handle a large tonnage economically, though handicapped by a few constructional drawbacks and rather low-grade ore.

Tennessee

Tennessee Copper Company—Walter Lewisohn states that the contract with the United States Agricultural Corporation is now closed. The Tennessee Copper Company has already received $500,000 in cash, and will receive $1,000,000 before the end of July. The agreement between the Tennessee Copper Company and the United States Agricultural Corporation, whereby the latter acquires all the acid output of the former, stipulates payments as follows: $1,500,000 preferred stock of the Agricultural Corporation, of which $500,000 has already been paid in cash (the stock having not yet been issued), and of which $1,000,000 is to be paid Jan. 1, 1910; $825,000 in common stock, to be paid over to the Tennessee Copper Company upon issuance; $1,000,000 cash payable during May and July, this year; and $1,000,000 cash and $250,000 in preferred stock to reimburse the Tennessee Copper Company for improvements and additions to that extent made to the sulphuric plant.

Utah

BEAVER COUNTY

Majestic Mines—In the new silver-lead orebody on the 500-ft. level of the Harrington-Hickory, it is stated that the north drift is in about 60 ft. and the south drift about 30 ft., and as yet the walls have not been encountered. This is said to be the best showing of silver-lead ore that has been found on the property in recent years.

Moscow Bonanza—D. H. Ferguson, superintendent of the Cedar-Talisman, has taken a lease on this property adjoining the Burning Moscow.

Leonora—The tunnel is now in over 200 ft. in very promising territory. The tunnel is to develop a group of 11 claims in the Star district in the vicinity of the Cedar-Talisman, Mowitza, etc.

Beaver Carbonate—A large body of low-grade ore has been encountered on the 700-ft. level, about 100 ft. farther east than where the first ore was opened on this level. D. C. Williams is in charge of the mine.

Deer Trail—Development work has been in progress all winter on this property near Marysvale. A good grade of gold bearing ore has been opened up and numerous improvements are contemplated during the summer.

SALT LAKE COUNTY

Utah Copper Company—During March upward of 7000 tons of ore were milled per day, production being estimated at between 4,500,000 and 5,000,000 lb. of copper. This is the first month when the company has had all 12 sections of its Garfield mill in operation.

Boston Consolidated—During March, 10 of the 13 sections of the mill were in operation. Ore milled was 53,100 tons, producing 2750 tons of concentrates, containing 1,105,000 lb. of copper. The eleventh section will go into operation during April. The Porphyry mine in March produced about 300,000 lb. of copper.

United States Smelting, Refining and Mining Company—Internal difficulties in this company have been settled by the purchase of the stock of R. D. Evans, amounting to about 100,000 shares, which has been taken over by the Winslow faction. The transaction involved about 60,000 shares of common and 40,000 shares of preferred stock. The price is said to have been somewhat above the recent quotations.

Utah Consolidated—The report for the operations of 1908 shows that 248,215 tons of ore were treated, producing: copper, 10,648,243 lb.; silver, 265,284 oz.; gold, 23,440 oz. The net profits for the period are given at $326,312. The company carries a reserve for contingent liabilities of $452,435 and the profit and loss surplus is $1,256,952.

Washington

KITTITAS COUNTY

Skookum Copper—Construction work is progressing on the big concentrator in the Cle Elum district, and it is expected that this plant will be turning out concentrates by the middle of the summer.

OKANOGAN COUNTY

Gold Dust—A deposit of good copper ore was recently encountered on one of the lower levels.

Dry Gulch—E. M. Cammon has opened a 4-ft. vein of low-grade copper ore, three miles east of Oroville.

Canada

BRITISH COLUMBIA

Among recent company incorporations filed at Victoria are the following: The Slimes Treatment Company, Ltd., to ac-

quire the metallurgical patents granted Horace G. Nichols, of Ymir, B. C., for treating slimes or sands from which the valuable contents have been extracted by cyanide from gold and silver ores, and generally for recovering the solutions from pulp and extracting the solid contents from mill tailings. The Tyee-Swayne Copper Mines, Ltd., to acquire certain mineral claims adjoining Lynn creek, New Westminister mining division, B. C., and to have said claims mined and managed by the Tyee Copper Company, Ltd. The authorized capital of each company is $100,000.

BRITISH COLUMBIA—SLOCAN

Lucky Jim—Work has been resumed at this lead-zinc mine, situated on the Kaslo-Sandon railway line. Arrangements are being made to ship ore, much of which contains a large proportion of zinc.

Slocan Star—The Byron N. White Company has shipped some high-grade silver-lead ore from the Hidden Treasure claim of its Slocan Star group. The Consolidated Mining and Smelting Company of Canada, Ltd., opened a body of valuable ore on its Richmond-Eureka property, and its Eureka No. 5 tunnel has been driven through one corner of the Hidden Treasure claim, in ore all the way. The White Company is driving on the vein in its Slocan King claim at a depth on the dip of vein of 650 ft. below the above-mentioned ore shoot on the Eureka.

BRITISH COLUMBIA—SIMILKAMEEN

Daly Reduction Company—The spring thaw has caused water to flow in the flume from Twenty-mile creek, so power is available for the stamp mill at Hedley and the stamps are dropping again.

Golden Zone—A shaft is being sunk in good ore. This mine is in Hedley camp.

Yale Mining Company—Work has been resumed at the Nickel Plate mine, near Hedley, after the winter shut-down.

NOVA SCOTIA

Nova Scotia Steel and Coal Company—The bill now before the Nova Scotia legislature to enable this company to effect a financial reorganization, which provides for the redemption of the company's preferred stock at $120 per share, has been amended owing to the objections of the shareholders to being forced to accept that figure, leaving the holders of preferred stock at liberty to fix their own price.

ONTARIO—COBALT DISTRICT

Bailey—This company has cancelled the lease, under which the north half of the property has been worked by the Cobalt Central mines, from April 1, and will shortly begin diamond drilling on a large scale to prove several veins which look well on the surface. Arrangements are being made for the installation of a large plant and buildings to accommodate a larger force of men. Power will be obtained from Ragged Chutes on the Montreal river.

Beaver—The engine house was destroyed by fire on April 5. Operations were resumed, the company obtaining a supply of power by arrangement with the Temiskaming.

Cobalt Treasure—At a meeting on April 7, in Toronto, terms were arranged for an amalgamation between the Cobalt Treasure and the Paymaster; giving the consolidated company 63 acres and a capitalization of $2,000,000. A shaft is down on the property 110 ft. J. Trethewey is president and G. H. Schlund, Cobalt, secretary.

Alexandra—A vein encountered at the depth of 160 ft. as a narrow stringer has widened at the 170-ft. level and shows good silver contents. A new calcite vein 6 in. wide, has been found on the surface.

Ore Shipments—Shipments of ore from Cobalt for the week ended April 10 were: Crown Reserve, 118,340 lb.; Cobalt Central, 43,490; City of Cobalt, 109,000; Kerr Lake, 40,360; La Rose, 324,540; Nipissing, 128,880; O'Brien, 64,170; Right of Way, 283,000; Silver Queen, 62,865; Temiskaming, 120,000; total, 1,294,653 pounds.

YUKON TERRITORY

The new reduction plant of the Yukon District Gold Mining Company, Ltd., at Conrad, is in successful operation, and producing concentrates which are shipped to Tacoma.

Mexico

CHIHUAHUA

Alvarado—Boston capitalists are operating the mine under a 15-year lease. Plans are being made to handle 1000 tons per day.

DURANGO

Velardeña—One copper and three lead furnaces are in operation. Ore is accumulating, and another furnace will be blown in soon. There is a general improvement in the camp.

MEXICO—EL ORO

Esperanza—The last dividend makes the returns to shareholders 410 per cent. upon the capitalization of $2,250,000. Recent installations of machinery and improved mining methods have made this property more profitable than ever before.

El Oro—Report for March: Mill No. 1 ran 31 days, mill No. 2 ran 30 days; ore crushed, 26,331 tons, yielding $214,740; working expenses $118,490; expenditure on development $23,121; total $141,611; profit $73,129; profit on railway $4000; total profit $77,129; expenditure on permanent improvements $1000.

Mexico Mines—Report for March: Mill ran 23 days, crushed 6524 tons of ore, yielding $76,020; expenses $32,790; expenditure on development $8600; total $41,390; profit $34,630; expenditure on permanent improvements $1000.

OAXACA

Natividad—The differences between the two factions have been settled by a compromise. Dr. Carlos Fenelon has been chosen president in place of Antonio Allende.

Victoria-Tapada—Three carloads of boilers and supplies have arrived for the new mill.

SONORA

Creston-Colorado—Two hundred and fifty tons of ore per day are crushed. Since 1902 this property has paid its shareholders $3,387,000.

Africa

TRANSVAAL

The gold production in March is reported by cable at 608,000 oz. fine; an increase of 42,782 oz. over February, and of 33,509 oz. over March, 1908. The gain was due to the greater length of the month, the daily average having decreased from 20,186 oz. in February to 19,613 oz. in March. For the three months ended March 31 the total output was 1,677,160 oz. fine gold in 1908, and 1,788,331 oz.—or $36,964,802—in 1909; an increase of 111,171 oz., or 6.6 per cent.

Asia

INDIA—MYSORE

Kolar Goldfield—Gold production in March is reported at 46,284 oz. bullion, being 4125 oz. more than in February. For the three months ended March 31 the total was 135,869 oz. bullion in 1908, and 135,805 oz. in 1909; a decrease of 64 oz. only. The bullion reported this year was equal to $2,526,391, or 122,225 oz. fine gold.

Australia

NEW SOUTH WALES

Gold production in March was 7645 oz.; for the three months ended March 31 it was 55,752 oz., or $1,152,394 in value.

New Zealand

Gold exports in March were 41,485 oz. bullion in 1908 and 40,044 oz. in 1909; decrease, 1441 oz. Exports of silver, 89,038 oz. in 1908, and 204,008 oz. in 1909; increase, 114,970 oz. The gold bullion reported this year was equal to $809,307, or 39,154 oz. fine gold.

The Mines Department reports that gold exports in January were 59,072 oz. bullion in 1908, and 35,956 oz. in 1909; a decrease of 23,116 oz. The bullion reported this year was equal to $709,823, or 34,341 oz. fine gold. Exports of silver were 111,207 oz. in 1908, and 44,426 oz. in 1909; a decrease of 66,781 oz. this year.

Metal, Mineral, Coal and Stock Markets

Current Prices, Market Conditions and Commercial Statistics of the Metals, Minerals and Mining Stocks

QUOTATIONS FROM IMPORTANT CENTERS

Coal Trade Review

New York, April 21—The coal trade in the East remains quiet as far as bituminous is concerned. The only marked incident is found in the fact that West Virginia mines are bidding more actively for business and low prices have been made for Pocahontas and New River coal, f.o.b. Newport News and Lambert's Point. It is said that there is to be a readjustment of rates on West Virginia and Pennsylvania coals.

The anthracite situation shows nothing new this week. The operators' committee, the appointment of which was noted last week, has made no report as yet, and probably will make none for several days. The miners have intimated their determination not to accept the terms offered by the operators, but it is quite possible that a change may come after the meeting which is to be held April 22. The situation is unchanged, but there are no indications that the operators will give way.

In the West, steam-coal trade continues to show a slight improvement, which is comparatively steady, although not marked. It is noticeable throughout Indiana and Illinois that while mines are restricting shipments for the present, they are preparing for a large trade. The opening of the Lake trade is temporarily held up by the controversy over rates to Lake ports. There were some fears of a strike on Lake vessels, owing to the insistence of the Lake Carriers' Association on the open shop; but it looks now as if this would not seriously interfere with shipments.

Lake Coal Rates—The different railroads concerned have anounced the following rates to Lake Erie ports on Lake coal, effective May 15. The rates are given in cents per ton, the third and fourth columns showing the differential, compared with the Pittsburg district, as a base:

	Rates— Old.	Rates— New.	Differential— Old.	Differential— New.
Pittsburg	88.00	88.00	.....	.....
Ohio	85.00	85.00	— 3.00	— 3.00
Fairmont, W. Va.	96.75	100.00	+ 8.75	+12.00
Kanawha, W. Va.	97.00	106.25	+ 9.00	+18.25
New River, W. Va.	113.00	121.25	+25.00	+33.25

Immediately after the publication of these rates a number of West Virginia operators applied to the United States district courts for West Virginia and secured a temporary injunction restraining the railroads from filing or enforcing the new rates, with April 23 fixed as the date for arguing the case.

Coal Traffic Notes

Tonnage originating on Pennsylvania railroad lines east of Pittsburg and Erie, year to April 10, short tons:

	1908.	1909.	Changes.
Anthracite	1,451,137	1,404,832	D. 46,305
Bituminous	9,329,117	9,750,218	I. 421,101
Coke	1,970,634	2,749,239	I. 778,605
Total	12,750,888	13,904,289	I. 1,153,401

The total increase this year to date was 9 per cent.

Bituminous coal and coke shipments, Pennsylvania and West Virginia, two months ended Feb. 28, short tons:

	Coal.	Coke.	Total.
Balt. & Ohio	3,118,618	661,092	3,779,710
Buff., Roch. & Pitts.	897,383	68,626	966,009
Buff. & Susqueh'na	263,853	48,023	311,876
Penn. lines, N. Y. C.	1,288,447	14,936	1,303,383
Pitts. & L. Erie	1,014,213	687,195	1,701,408
Norfolk & Western	1,836,520	428,914	2,265,434
Ches. & Ohio	1,883,543	75,007	1,958,550
Total	10,302,577	1,983,793	12,286,370
Total, 1908	9,527,201	1,222,594	10,749,795

Total increase this year, 1,536,575 tons, or 14.3 per cent. In addition the Baltimore & Ohio carried 154,302 tons anthracite in 1908, and 163,824 in 1909; increase, 9522 tons.

Coal tonnage of railroads in Ohio Coal Traffic Association, two months ended Feb. 28, short tons:

	1908.	1909.	Changes.
Hocking Valley	413,856	471,013	I. 57,157
Toledo & Ohio Cent.	175,082	174,988	D. 94
Baltimore & Ohio	293,984	172,327	D. 121,657
Wheeling & L. Erie	420,151	406,647	D. 13,504
Cleve., Lorain & Wh.	397,779	283,800	D. 113,979
Zanesville & Western	215,286	206,456	D. 8,830
Toledo Div., Pen. Co.	317,879	308,205	D. 9,674
L. Erie, Alliance & Wh.	190,226	177,751	D. 12,475
Marietta, Col. & Clev.	12,577	6,882	D. 5,695
Total	2,436,820	2,208,069	D. 228,751

The total decrease shown this year was 9.4 per cent.

Coastwise shipments of coal from leading Atlantic ports, two months ended Feb. 28, long tons:

	Anthracite.	Bitum.	Total.	Per Ct.
New York	2,332,397	1,610,236	3,942,633	65.0
Philadelphia	274,750	690,443	965,193	15.9
Baltimore	28,429	536,707	565,136	9.3
Newp't News	.....	373,631	373,631	6.2
Norfolk	.....	217,312	217,312	3.6
Total	2,635,576	3,428,329	6,063,905	100.0
Total, 1908.	2,884,787	3,489,836	6,374,623	.....

Total decrease this year, 310,718 tons, or 4.9 per cent. New York includes all the New York harbor shipping points.

Coal shipments by water from Seattle and Tacoma, Wash., two months ended Feb. 28 were 112,654 tons in 1908, and 43,223 in 1909; a decrease of 69,431 tons.

Coal tonnage passing Lock No. 3 on the Monongahela river was 777,335 tons in February; for the two months ended Feb. 28 it was 1,705,739 tons.

Coal receipts at St. Louis, two months ended Feb. 28, were 1,339,952 tons in 1908, and 1,203,135 in 1909; decrease, 136,817 tons.

New York

Anthracite

April 21—Current trade continues steady and it is not at all affected by strike rumors. For prepared sizes business is good, many taking advantage of the April discount. No announcement has been made yet as to the discount in May, but something is expected daily. Steam sizes are still rather scarce.

Prices are $4.25 for lump and $4.50 for egg, stove and chestnut f.o.b. New York harbor points. For small steam sizes prices are nominally: Pea, $3.25@3.50; buckwheat No. 1, $2.35@2.50; buckwheat No. 2 or rice, $1.60@2; barley, $1.35@1.50; all f.o.b. New York harbor points. Advances are asked by commission merchants.

Bituminous

Trade on the Seaboard continues slow. Contracts are dragging and it looks as if a considerable number—much more than usual—would go over until after May 1. The trade has been rather demoralized in New England territory by offers of West Virginia coal at low prices and by reports as to the intentions of the new Virginian railway to cultivate Eastern trade. The far East, accordingly, seems to be holding back, although it is known that consumers' stocks are low.

Along the Sound, trade is only fair and orders are rather irregular. New York harbor is the same as it has been for some time, buyers apparently watching for chances to get cheap coal. Fair grades of steam coal can be had at $2.35@2.40 f.o.b. harbor points, and some speculative coal has sold as low as $2.20.

All-rail trade continues fair. Transportation is rather slow, although car supply is good; and there is some delay in tidewater deliveries.

In the Coastwise vessel market there is a temporary scarcity of boats, which is due to foggy and stormy weather holding vessels at Eastern ports. Rates from Philadelphia are unchanged. From New York cargoes have been taken at 60c. to points around Cape Cod, and 70c. to Lynn and Saco.

Birmingham

April 19—The coal market in Alabama shows no improvement. The production is about the same it has been for the past

four months. Coal miners complain as to the unsteady work. There have not been many mine workers leaving the district so far, the anticipation being that there is soon to be a change for the better. Coke ovens are doing well, as coke is being stacked up and there is a little better demand for the product. Coal quotations are down, but this has not proved much inducement in securing business.

Chicago

April 19—Quiet conditions of buying and selling continue in the coal market. Wholesalers and retailers alike are selling small lots, the weather conditions and the caution among consumers being dominant on the market. Fine coals continue to increase in demand and will grow in popularity as warm weather advances. Little demurrage coal is on the market.

Illinois and Indiana lump brings $1.75@2.25; run-of-mine, $1.65@1.75, and screenings, $1.40@1.60. There is some overshipment of the best grades of Illinois lump.

Eastern coals are in good condition generally, smokeless being free from demurrage evils and selling at $3.20@3.45 for lump and $3.05@3.15 for run-of-mine. Hocking Valley is in somewhat too plentiful supply, with prices 10 or 15c. under the $3@3.15 standard quotations. Youghiogheny at $3.15 for gas lump and Pittsburg No. 8 at $3.85, remain steady, though Pittsburg occasionally has demurrage troubles and consequent low sales.

Cleveland

April 20—The spring weather has stopped domestic coal-trade activity. Some Massillon coal is selling at $2.25@$2.30 for lump and $2.15 for run-of-mine, both at mines. Steam-coal sales are better than they have been, but without much improvement in prices, which may be quoted around $1.35 at mine for lump, $1.10 for run-of-mine, and 55@75c. for slack.

It does not appear likely that the attitude of the unions will interfere with Lake shipments. The controversy over the new rates from the mines will have some effect in delaying shipments.

Indianapolis

April 19—Master in Chancery Edward Daniels, in addition to offering for sale by virtue of a decree of the Federal Court on May 1, at Bloomfield, Ind., a large amount of mining property belonging to the Indiana Southern Coal Company, will also, on the same day, sell to the highest bidder at the court house in Sullivan, Ind., the following property belonging to the Southern Indiana Coal Company: The Gilmore, the Shelburn, the Alum Cave, the Forest Park, the Cummings, the Indiana Hocking, the Citizens, the Rainbow, the Bunker Hill, the Richmond, and the American mines, together with adjoining tracts of coal land and timber land. The proposed sale is creating much interest and the number of bidders promises to be large.

Pittsburg

April 20—Lake shipments are limited, as few of the large boats are ready to go into commission. The Hanna interests are sending out considerable tonnages and, as they are buyers of the surplus product of the Pittsburg-Buffalo Company, that concern is operating its mines almost to capacity. The railroad mines in the Pittsburg district are being operated at between 50 and 60 per cent., but all of the river mines are going. While efforts are being made to hold the price at $1.15 for mine-run coal at mine, the bulk of the sales during the past week have been at $1.10 and less. Slack is quoted at 55@60c. The rivers were navigable during the closing days of last week; some coal went to lower ports and a number of empty coal boats and barges were returned.

Connellsville Coke—There are no signs of improvement and ovens are being closed. Furnace coke has sold down to $1.40 for prompt shipment and foundry spot at $1.85; and it is possible that a lower price would be accepted. On contract foundry coke is quoted at around $2 and for second half, $2.10 could be done, although some producers are naming $2.25 as the minimum price for late shipments. On contract, furnace coke is quoted at $1.60@1.75, and it is understood these prices would be taken for delivery in the third quarter, but not for the entire second half.

The *Courier* gives the production for the week in both regions at 233,718 tons. The shipments amounted to 8679 cars as follows: To Pittsburg district, 3579; to points west of Pittsburg, 4358; to points east of Connellsville, 742 cars.

Foreign Coal Trade

British Coal—Exports of fuel from Great Britain, with coal sent abroad for the use of steamships in foreign trade, three months ended March 31, long tons:

	1908.	1909.		Changes.
Coal	14,211,160	13,914,097	D.	297,063
Coke	280,955	270,145	D.	10,810
Briquets	378,612	338,915	D.	39,697
Total exports	14,870,727	14,523,157	D.	347,570
Steamer coal	4,704,209	4,520,902	D.	183,307
Total	19,574,936	19,044,059	D.	530,877

The total decrease in coal sold for consumption beyond the limits of the United Kingdom was 2.7 per cent.

Welsh Coal Prices—Messrs. Hull, Blyth, & Co., London and Cardiff, report current prices of coal as follows, on April 10: Best Welsh steam, $3.54; seconds, $3.42; thirds, $3.30; dry coals, $3.48; best Monmouthshire, $3.12; seconds, $3.06; best small steam, $2.46; seconds, $2.16. All per long ton, f.o.b. shipping port.

German Coal Trade—Imports and exports of fuel in Germany, two months ended Feb. 28, metric tons:

Imports:	1908.	1909.		Changes.
Coal	1,357,177	1,136,541	D.	220,636
Brown coal	1,364,119	1,101,213	D.	262,906
Coke	84,163	100,223	I.	16,060
Briquets	31,439	30,606	D.	833
Exports:				
Coal	3,138,626	3,511,347	I.	372,721
Brown coal	4,043	4,553	I.	510
Coke	664,031	531,077	D.	132,954
Briquets	272,279	203,951	D.	68,328

Coke exports this year included 4716 tons to the United States.

German Coal Production—Coal production in German Empire, two months ended Feb. 28, metric tons:

	1908.	1909.	Changes.
Coal	25,221,866	23,562,253	D. 1,659,613
Brown coal	11,106,716	10,892,060	D. 214,656
Total mined	36,328,582	34,454,313	D. 1,874,269
Coke made	3,634,541	3,428,731	D. 205,810
Briquets made	2,936,120	2,876,673	D. 59,447

Of the briquets reported this year 2,263,870 tons were from brown coal, or lignite.

Iron Trade Review

New York, April 21—The iron and steel trades continue to improve and, though the gain is somewhat irregular, there is marked activity in several lines, while in others there is a perceptible advance. It is to be noted that at the annual meeting of the Steel Corporation yesterday, Judge Gary expressed himself hopefully and noted a considerable improvement over the December quarter.

Structural steel is the most active section of the market and large orders for bridges and buildings continue to be placed. Building material of all kinds is very active and the aggregate tonnage placed has been large. There has also been an active trade in bars. It is reported that prices have been cut to secure some large orders and that there is sharp competition for the business which is coming forward. Sheets also have been active, though not quite to the same extent as bars and structural steel; nevertheless a fair business has been done. The American Steel and Wire Company has announced a reduction of $2 per ton on wire and wire products. This was generally expected, but the cut is less than had been anticipated.

Rail orders are coming in slowly. There have been reports that a reduction in prices of steel rails was under discussion, but it is not possible to ascertain anything definite on this point. The Lackawanna Steel Company has taken a contract for 15,000 tons of rails for Cuba. The Grand Trunk Pacific has placed its large orders for rails in Canada, 22,000 going to the Algoma Steel Company at Sault Ste. Marie and 15,000 tons to the Dominion Steel Company at Sydney.

In pig iron, sales in the West have not been large but an increasing quantity of foundry iron is reported taken in Eastern territory. There is also a better demand for basic pig. Southern iron has secured the majority of the foundry orders and the furnaces there being fairly well supplied with orders for the present, are holding prices a little more firmly.

United States Steel Corporation—At the annual meeting, April 19, the directors whose terms then expired were all re-elected as follows: William Edenborn, Henry C. Frick, William H. Moore, Norman B. Ream, James H. Reed, Charles Steel, P. A. B. Widener, Robert Winsor. Alfred Clifford was also chosen a director to succeed James Gayley, resigned.

Baltimore

April 20—Imports for the week included 21 tons spiegeleisen and 1125 tons ferromanganese from Great Britain; 13,150 tons manganese ore from India; 5150 tons iron ore from Cuba.

Birmingham

April 19—The pig-iron market condition in the Southern territory is looking up. The quotations are firm around $11.50 per ton, No. 2 foundry. If there is any iron being sold now under that price very little is being said about it. The shipments out of the district and the home melt require considerable iron and there is not a great accumulation. While no large sales have been made in the last few days there have been a few orders taken in and a number of inquiries received that give encouragement.

The steel plant of the Tennessee company, at Ensley, will produce something like 1000 tons of rails a day on an export order this week. Other orders are said to be in sight which means that there may be no necessity of shutting down the big plant.

The trustees of the Quinn Furnace Company, which owns a 75-ton charcoal furnace at Attalla, Ala., sold the property this week at public outcry. There were no incumbrances on it. The Shelby Iron Company has one furnace in operation making charcoal iron.

Chicago

April 19—Sales of pig iron are increasing, with the general betterment of business and the realization by melters that prices are not likely to go lower. But improvement is as yet spasmodic; it shows waves of activity and dullness. The best index of market conditions seems to lie in prices. Southern iron now holds firmly to $11; on some sales it is $11.50, Birmingham, these prices representing $15.35 and $15.85, Chicago, respectively. Occasionally a large purchase is made for current needs and those of the third or fourth quarters, but for the most part business continues to be of the small-lot, quick-delivery variety.

The average consumer of pig iron is having his confidence quietly restored. But he will not as yet invest heavily in the future. His needs as regards Northern iron are steady, but small, and Northern remains constant at $16.50@17. Lake Superior charcoal, with a steady demand and well-regulated supply, is firm at $19.50.

Sales of iron and steel products continue to show a fair increase. Coke is stationary, with light sales, the best Connellsville bringing $4.70@4.85, Chicago.

Philadelphia

April 21—Pennsylvania makers have begun to find customers for small lots of iron for early delivery. All efforts to secure long contracts have failed. Southern makers are evidently shading still farther; a number of recent orders here have gone South, two or three to Virginia furnaces. The local demand is perceptibly better, but the sales are small and for pressing requirements. Generally speaking, the tone of this market is better.

Steel Billets—The usual hand-to-mouth business is reported, with prices tending to a lower level.

Bars—Mill trade less active than a week ago. Stores report a moderate improvement in retail demand.

Sheets—The sheet mills have succeeded in gaining considerable business for early summer delivery, but at buyers' prices.

Pipes and Tubes—All kinds of pipe work are doing better.

Plates—The balance of uncompleted work at most mills is getting rather low. Local demands just at present cut a small figure.

Structural Material—A large amount of work has been placed in Pennsylvania mills, the bulk of business for Eastern construction requirements going to mills in the western end of the State. An improvement is noted within a week in demand for local building needs.

Scrap—Millmen and others have made purchases of heavy scrap. Foundries are making inquiries. Scrap dealers are feeling better.

Pittsburg

April 20—Favorable prospects are still indicated in the iron and steel trade by increasing orders for nearly all lines of finished products. These orders are for small tonnages, but the aggregate is large and production at a number of plants in the Pittsburg and surrounding districts has been greatly increased. The Carnegie Steel Company is operating more mills at its Homestead and Duquesne works than last week. New business in wire and wire products is still confined to small tonnages as the expected readjustment in prices by the American Steel and Wire Company has not been announced. In the meantime other producers are said to be seriously shading current quotations, particularly in nails. The National Tube Company continues to book new orders for merchant pipe and is running its plants in the Pittsburg district at around 80 per cent. Spang, Chalfant & Co. have taken an order for 20 miles of 12-in. pipe. As announced two weeks ago, the Republic Iron and Steel Company will build a large tube plant. Details were officially given out during the past few days. The works will be built by the Haselton Steel Company, which was formed by interests connected with the Republic company, and the pipe concern will be operated as a subsidiary company. Additional pipe mills are to be built by the Youngstown Sheet and Tube Company.

In tinplate contracts at current prices are being made for delivery all year, but in sheets present prices will not be accepted for delivery beyond July 1. Rail buying continues slow. Reports that a reduction in the price of steel rails is under consideration are not credited here.

The structural-steel trade is quiet owing to the great irregularity in prices. Some new business has been offered and rejected by fabricators on account of the extremely low rates named. There are several good contracts being held up because of the uncertainty regarding prices. Prices in plates and steel bars are weak, as considerable shading has been done lately. It is reported that the Steel Corporation took a large contract for plates from a concern that had been supplied by the Jones & Laughlin Steel Company by naming a low price. In retaliation, it is reported, the Jones & Laughlin company has been quoting steel bars $2 per ton under the established rate.

Pig Iron—No sales of any consequence have been made for over a week. Quotations, which are purely nominal, are as follows: Standard bessemer, $14.75@15; malleable bessemer, $14.50; basic, $14.25@14.50; No. 2 foundry, $14@14.25; gray forge, $13@13.25, all f.o.b. Valley furnaces.

Steel—There are reports of shading of the established price of $23, Pittsburg, on bessemer and open-hearth billets, but shipments are on sliding-scale contracts. Merchant-steel bars are quoted at 1.2c., but sales are being made at 1.1c., but not for delivery beyond July 1. Plates are still quoted at 1.3c., but this rate is not firmly maintained.

Sheets—The sheet market continues satisfactory, and prices are firm. It is not possible to contract beyond July 1 for sheets at present prices. Black sheets are quoted at 2.25c. on large tonnages, and 3.25 for galvanized, No. 28 gage.

Ferro-manganese—The market is stronger owing to a couple of large sales for delivery in the West. The latest quotation is $45 Pittsburg.

Foreign Iron Trade

German Iron and Steel Trade—Exports and imports of iron and steel and of machinery in Germany, two months ended Feb. 28, metric tons:

	Exports.	Imports.	Excess.
Iron and steel.....	556,903	59,368	Exp. 497,535
Machinery.....	46,087	6,852	Exp. 39,235
Total.....	602,990	66,220	Exp. 536,770
Total, 1908.....	609,604	93,653	Exp. 515,951

Decrease in exports this year, 6614 tons, or 1.1 per cent.; in imports, 27,433 tons, or 29.3 per cent. Imports of iron ore for the two months in 1909 were 1,050,580; exports, 438,749 tons. Imports of manganese ore, 48,373; exports, 370 tons.

German Steel Syndicate—Sales of the German Steel Syndicate for the two months ended Feb. 28 were 224,743 tons billets and other half-finished material; 325,928 railroad material; 256,156 shapes, plates, etc.; total, 806,827 metric tons, an increase of 3223 tons over last year.

Metal Market

New York, April 21—The metal markets generally show little change since our report of last week. Some improvement is noted, but it is of gradual nature.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Mar. 1909..	$21,252,462	$ 5,161,648	Exp. $16,090,814
" 1908..	1,447,206	3,649,407	Imp. 2,202,201
Year 1909..	37,978,632	12,158,275	Exp. 25,820,357
" 1908..	3,859,003	17,296,024	Imp. 13,437,021
Silver:			
Mar. 1909..	5,079,287	3,279,531	Exp. 1,799,756
" 1908..	4,329,369	3,757,027	" 572,342
Year 1909..	14,473,930	10,453,218	" 4,020,712
" 1908..	12,586,287	10,830,656	" 1,755,631

Exports from the port of New York, week ended April 17: Gold, $550,100, chiefly to Brazil; silver, $856,016, to London and Paris. Imports: Gold, $181,093; silver, $23,947, from Central and South America.

Foreign trade of the United States, three months ended March 31, as valued by the Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1908.	1909.
Exports.....	$ 515,459,899	$ 421,967,296
Imports.....	258,863,772	355,649,324
Excess, exports.....	$ 256,596,127	$ 66,317,972
Add excess of exports, silver.....		4,020,712
Add excess of exports, gold.....		25,820,357
Total export balance.....		$ 96,159,041

The gold and silver movement is given in the table at the head of this column.

Gold—The price of gold in the open market in London was unchanged at the usual level. The Bank of France, after a suspension of buying for several weeks, this week took all the Transvaal gold arriving. In New York $250,000 were taken for export to Amsterdam and $500,000 for Brazil.

Platinum—Dealers' prices are unchanged at $23@24 per oz. for refined platinum; $26 for hard metal and $19@21 for scrap. Business is improving a little and sales are much better than at this time last year.

Silver—Owing to China and speculative buying silver has had quite a sharp advance. While the buying has not been aggressive, it is estimated up to the present time for the year shipments of over £925,000 have been consigned to China; and it is worth while noting that this amount in 3½ months is larger than the total shipment to China in 12 months of any year since 1900.

SILVER AND STERLING EXCHANGE

Apr.	15	16	17	19	20	21
New York....	51 1/16	50 7/8	51 3/8	51 1/8	51 1/2	51 7/8
London.....	23 15/16	23 7/16	23 5/8	23 13/16	23 11/16	23 3/4
Sterling Ex..	4.8770	4.8770	4.8770	4.8775	4.8770	4.8765

New York quotations, cents per ounce troy, fine silver: London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, reported by Messrs. Pixley & Abell, year to April 7:

	1908.	1909.	Changes.
India.....	£ 2,136,538	£1,150,600	D. £ 985,938
China.....	501,400	925,600	I. 424,200
Straits.....	78,270	82,800	I. 4,530
Total.....	£ 2,716,208	£2,159,000	D. £ 557,208

Imports for the week, £4000 from the West Indies and £110,000 from New York; £114,000 in all. Exports, £1000 to Egypt and £55,600 to India; £56,500 in all.

Copper, Tin, Lead and Zinc

Apr.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
15	12 3/4 @13	12 1/4 @12 3/8	57 3/8	29 3/8	4.15 @4.20	4.07 1/2 @4.10	4.85 @4.87 1/2
16	12 3/4 @13	12 1/4 @12 3/8	57 1/4	29 3/8	4.15 @4.20	4.07 1/2 @4.10	4.87 1/2 @4.90
17	12 3/4 @13	12 1/4 @12 3/8	....	29 3/8	4.20	4.10	4.90 @4.92 1/2
19	12 3/4 @13	12 1/4 @12 3/8	57 1/4	29 1/2	4.20 @4.25	4.10 @4.15	4.92 1/2 @4.95
20	12 3/4 @13	12 1/4 @12 3/8	57 1/4	29 3/4	4.20 @4.25	4.10 @4.15	4.92 1/2 @4.95
21	12 3/4 @13	12 1/4 @12 3/8	57 1/4	29 3/8	4.20 @4.25	4.10 @4.15	4.92 1/2 @4.95

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis, New York, cash. The price of cathodes is usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—The market has been quiet and featureless since April 14. The European buyers are well covered and on that account are not placing orders for the time being. Some business is being done in the home market from day to day, but the transactions are not large. Lake copper has been freely sold at 12⅞c. for good ordinary brands, while some special brands have fetched 13c. All of the selling agencies are freely offering electrolytic copper at 12¾c. delivered, 30 days, equivalent to a little less than 12⅝c., cash, New York, and most of them make concessions of a few points to consummate business. The close is unchanged at 12⅞@13c. for Lake copper; 12½@12⅝c. for electrolytic copper in ingots, cakes and wirebars. The average of the week at which business in casting copper has been done is 12⅜@12½ cents.

Copper sheets are 16½c. base for large lots. Full extras are charged, and higher prices—up to 18c.—for smaller quantities. Copper wire, 14¼c. base, carload lots at mill.

The volume of business on the London Metal Exchange in standard sorts has dwindled down considerably, and the market has been slightly reactionary. The close is barely steady at £57 2s. 6d. for spot, £57s. 17s. 6d. for three months.

Statistics for the first half of the current month show an increase in the visible supplies of 800 tons.

Refined and manufactured sorts we quote: English tough, £62; best selected, £61@62; strong sheets, £73@75.

Exports of copper from New York and Philadelphia for the week, 3897 long tons. Our special correspondent gives the exports from Baltimore at 1482 tons copper.

Stocks of copper in England and France on April 15 are reported by Messrs. Henry R. Merton & Co., of London, at 52,190 tons, an increase of 840 tons over March 31. The stocks include 8500 afloat from Chile and Australia.

The North Butte company in 1908 produced 36,929,028 lb. of copper, for which it received an average of 13.33c. per lb. This copper is sold by the United Metals Selling Company and is paid for on the basis of the average sales of that company during the third month following receipt of the ore. The North Butte was shut down during January and February, 1908. The quotational average for the 10 months corresponding to its settlements was 13.31 cents.

Tin—The London market has ruled somewhat firmer throughout the week. The favorable statistical position is given as the cause of the strength, but some talk about levying a duty on tin in this country, which resulted in speculative purchases of prompt material from this side, has, no doubt, added its share toward the advance. London closes at £136 12s. 6d. for spot, £134 15s. for three months, and the domestic market at about 29⅝ cents.

Arrivals of Bolivian tin in Europe in March are reported at 19 tons bars and 3100 tons concentrates; the whole equivalent to 1879 tons metal.

Lead—The inquiry for this metal from consumers continues to broaden, and a good-sized business has taken place from

day to day. Prices have gradually advanced and the market closes firm at 4.10 @4.15c. St. Louis, 4.20@4.25 New York.

The London market is soft and the close is cabled at £13 2s. 6d. for Spanish lead, £13 5s. for English lead.

Spelter—Galvanizers have placed large orders, due to an improvement in their business, and also in anticipation of the pending tariff legislation. On account of the uncertainty of an adequate ore supply, due to this tariff legislation, smelters have been very cautious in disposing of their metal and prices easily advanced. The close is firm at 4.92½@4.95c. St. Louis, 5.07½@5.10 New York, for prompt and early deliveries, but sales for future delivery have been made as high as 5c., St. Louis.

Quotations for spelter in New York April 15 were 5@5.02½c.; 16, 5.02½@5.05c.; 17, 5.05@5.07½c.; 19 to 21, inclusive, 5.07½@5.10 cents.

The London market is steady, good ordinaries being quoted at £21 12s. 6d., specials at £21 17s. 6d. per ton.

Base price of sheet zinc is now 6¾c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Upon application of Alton B. Parker, acting on behalf of the Trust Company of America, trustee for the bondholders, J. O. Rogers had been appointed receiver for the Lanyon Zinc Company. The petitioners declared that $1,783,000 of the company's bonds are still outstanding, on which there has been a default of interest amounting to $483,000, part of it due since 1905. This company was organized in 1899, was greatly over-capitalized, and never has been able to make a respectable showing on its stock, but up to a few years ago, succeeded in paying interest on its bonds. It is said that the receivership will not interrupt the operation of the company.

Other Metals

Antimony—There has been more buying than for several weeks, the activity being due to the expectation that a duty will be imposed on the metal. Prices are higher, 8½c. per lb. being paid for Cookson's; 8¼ for Hallett's and 7⅞@8c. for U. S. and other brands.

Aluminum—No. 1 ingots are still 22@24c. per lb., base price; wire, 31@32c. and sheets 33@34c. base. Business has been moderate, with no special features.

Quicksilver—Business has been rather quiet. New York quotations are lower, at $44.50 per flask of 75 lb. San Francisco nominal, at $44 for domestic and $42 for export. London price is unchanged at £8 7s. 6d. per flask, with 5s. less asked by second hands.

Nickel—Large lots, contract business, 40@45c. per lb. Retail, spot, from 50c. for 2000-lb. lots up to 55c. for 500-lb. lots. The price for electrolytic is 5c. higher.

Cadmium—Current quotation 75c. per lb., in 100-lb. lots, at Cleveland, Ohio.

Magnesium—Quotations for this metal are $1.25 per lb., New York, in 100-lb. lots; for 5-lb. lots, $1.40 per pound.

Zinc and Lead Ore Markets

Joplin, Mo., April 17—The highest price reported paid was $41.62 per ton, the assay base ranging from $38 to $39 per ton of 60 per cent. zinc, with some ore high in iron selling on a base of $40. Zinc silicate sold at $17.50@19.50. The average price, all grades, was $36.50. Lead sold as high as $58 on a base ranging from $56 to $57. The average price, all grades was $54.90 per ton.

The upward move in spelter had an immediate effect on the ore market, already on a nervous tension, and prices were advanced all along, from the cheapest silicates to the best blende ore. There was an average gain in price of 60c.; some ore purchased for next week's delivery was advanced as much as $2 per ton.

SHIPMENTS, WEEK ENDED APR. 17

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,863,200	1,274,080	$127,436
Joplin	2,138,360	439,890	52,724
Galena	603,770	154,970	15,583
Miami	596,020	195,700	15,215
Duenweg	612,590	41,680	12,008
Alba-Neck	549,780	.....	10,720
Spurgeon	342,970	117,950	8,505
Oronogo	248,950	126,660	7,201
Prosperity	248,950	75,030	6,692
Granby	423,110	11,000	6,200
Badger	358,080	21,050	6,062
Aurora	354,730	.....	5,398
Carthage	212,250	.....	4,138
Sarcoxie	235,310	.....	3,914
Quapaw	143,010	.....	2,336
Zincite	92,190	.....	1,752
Carl Junction	56,970	3,000	1,222
Stott City	40,370	.....	747
Everton	42,000	.....	420
Totals	12,159,330	2,461,110	$288,373
Sixteen weeks	179,417,860	39,627,190	$3,978,258
Zinc value, the week, $220,788; 16 weeks,			$3,211,336
Lead value, the week, 67,585; 16 weeks,			766,922

MONTHLY AVERAGE PRICES

Month.	Zinc Ore. Base Price.		Zinc Ore. All Ores.		Lead Ore. All Ores.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	$37.60	$41.25	$35.56	$38.46	$46.88	$52.17
February	36.63	36.94	34.92	34.37	49.72	50.50
March	36.19	37.40	34.19	34.71	49.90	50.82
April	35.40	.....	34.08	.....	52.47	.....
May	34.19	.....	33.39	.....	56.05	.....
June	33.06	.....	32.07	.....	60.48	.....
July	34.55	.....	31.67	.....	59.90	.....
August	36.53	.....	33.42	.....	60.34	.....
September	37.63	.....	34.44	.....	54.59	.....
October	35.95	.....	33.28	.....	52.63	.....
November	39.13	.....	35.02	.....	54.53	.....
December	42.75	.....	39.63	.....	49.68	.....
Year	$36.63	.....	$34.31	.....	$53.93	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Lead continues to advance a little each week, and the upward price has put upon the market several million pounds of reserve ore this month.

Platteville, Wis., April 17—This week the base price paid for 60 per cent. zinc ore was $38.50 per ton; this was the highest price paid this week. For 80 per cent. lead ore, $51 was paid; one choice car brought $53 per ton.

SHIPMENTS, WEEK ENDED APR. 17

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Platteville	570,270	68,480	165,100
Hazel Green	393,300	.....	.....
Benton	250,580	59,700	.....
Cuba City	161,400	.....	.....
Livingston	120,000	.....	.....
Galena	88,000	.....	.....
Strawbridge	52,100	.....	.....
Rewey	47,000	.....	.....
Total	1,682,650	128,180	165,100
Year to Apr. 17	29,843,524	907,460	2,736,650

In addition to the above there was shipped to the American Zinc Ore Separating Company, 111,140 lb. and to the Joplin Separator Works, 417,390 lb. zinc concentrates.

Chemicals

New York, April 20—The market is quiet, with little change from last week's report.

Copper Sulphate—No large sales reported. Prices unchanged at $4.60 per 100 lb. for carload lots, and $4.85 per 100 lb. for smaller parcels.

Arsenic—Quotations for white arsenic are 2⅞@3c. per lb. Sales about 50 tons for the week.

Nitrate of Soda—Current sales are light. Prices are a shade lower, at 2.12½@2.15c. for both spot and futures.

Mining Stocks

New York, April 21—A slight reaction early in the week brought about some liquidation. Aside from this, the general stock market has been strong throughout the week. Prices have held up well, especially in the industrial stocks, United States Steel being a leader in the movement. At the close of the week the Steel strength was helped by the hopeful statements made at the annual meeting on April 19.

A sale of Homestake, of South Dakota, was recorded, at $94.50 per share.

The directors of the Amalgamated Copper Company, on April 15, declared the usual quarterly dividend of ½ per cent. This action was generally expected.

On the Curb the course of the general exchange was followed rather closely. Early in the week there were some declines in the copper stocks, but these were recovered. At the close prices are a little irregular, but generally strong. Nevada Consolidated was the most active stock and realized a good advance.

It may be noted that the market was sustained throughout by a good buying movement on London orders.

Boston, April 20—The mining-share market has been one of specialties and as a rule price changes are without significance. North Butte made a low record at $66.25, which represents a decline of over $20 from the high of the year. Amalgamated shows slight net change as the result of the week's operations.

Boston banks have the largest amount of deposits in their history, some $197,160,000, which is certainly not a bear argument so far as the stock market is concerned.

The real feature has been U. S. Smelting, Refining and Mining. As a result both the common and preferred shares are much higher, the former $6.75 at $46.75 and the latter $2.50 at $47. Late discords in the management have been dispelled by the acquirement of R. D. Evans' holdings of some 60,000 shares of common and 40,000 shares of preferred at an average price of $50 per share for each. The late weakness in Utah Consolidated is now made clear by announcement of the resignation of James Phillips, Jr., from the board of directors. He is succeeded by Sidney Chase of this city.

Southwestern Development has been the Curb feature, advancing from under 20 to 90c. during the week. Speculation has been very active in this issue. Davis-Daly displayed a firmer tone on the final payment of the $2 assessment.

STOCK QUOTATIONS

NEW YORK	Apr. 21
Name of Comp.	Clg.
Alaska Mine	.40
Amalgamated	76½
Anaconda	45¼
Balaklala	‡2½
British Col. Cop.	6⅜
Buffalo Mines	‡3⅜
Butte Coalition	24¼
Colonial Silver	¾
Cum. Ely Mining	7⅝
Davis-Daly	6½
Dominion Cop.	1
Douglas Copper	2¾
El Rayo	2¾
Florence	3⅛
Foster Cobalt	.30
Furnace Creek	.11
Giroux	8
Gold Hill	⅛
Goldfield Con	8¼
Granby	96
Greene Gold	⅛
Greene G. & S.	7
Guanajuato	1¾
Guggen. Exp.	179
Hanapah	15
Kerr Lake	7⅜
McKinley Dar.	99
Miami Copper	14⅞
Micmac	¾
Mines Co. of Am.	1½
Mitchell Mining	⅛
Mont. Sho. C.	1⅝
Nev. Utah M. & S.	2½
Newhouse M. & S.	2⅞
Nipissing Mines	10¼
Old Hundred	⅜
Silver Queen	.46
Stewart	1/16
Tennessee Cop'r.	40⅞
Tri-Bullion	1/8
Union Copper	1⅞
Utah Apex	6⅛
Utah Copper	43½
Yukon Gold	4¼

*Ex. Div. †Ex. Rights.

BOSTON	Apr. 21
Name of Comp.	Clg.
Adventure	8½
Allouez	38¼
Am. Zinc	‡25¼
Arcadian	4⅛
Arizona Com.	42½
Atlantic	10½
Boston Con*	11⅛
Calumet & Ariz.	100¾
Calumet & Hecla	605
Centennial	‡30¼
Copper Range	78
Daly-West	10⅜
East Butte	16⅛
Franklin	16
Greene—Can.	10⅜
Hancock	10¾
Isle Royal	23¾
Keweenaw	3¼
La Salle	14
Mass	9⅛
Michigan	12
Mohawk	61
Nevada	20
North Butte	67¼
Ojibway	‡12⅛
Old Colony	48
Old Dominion	52
Osceola	129
Parrot	33¾
Quincy	88
Rhode Island	14¾
Shannon	14⅛
Superior	41
Superior & Bost.	15¾
Superior & Pitts.	13⅛
Tamarack	70
Trinity	14¼
U. S. Smg. & Ref.	45
U.S. Sm. & Re., pd.	46¾
Utah Con.	40¾
Victoria	‡4½
Winona	5
Wolverine	143
Wyandotte	‡2½

‡Last quotation.

N. Y. INDUSTRIAL	
Am. Agri. Chem.	38¼
Am. Smelt. & Ref.	88⅛
Am.Sm. & Ref., pf.	105¼
Colo. Fuel & Iron.	38½
Federal M. & S.,pf.	‡82
National Lead	88½
National Lead, pf.	104
Pittsburg Coal	10¼
Republic I. & S.	22¾
Republic I. & S.,pf.	74¼
Sloss-Sheffield	‡75
Standard Oil	670½
U. S. Steel	52
U. S. Steel, pf.	114⅝
Va. Car. Chem.	47½

BOSTON CURB	Low.
Ahmeek	160
Black Mt.	1 1/16
Chemung	18½
Globe Con	4⅛
Helvetia	2½
North Lake	‡7⅛
Ray Central	2 7/8
Ray Con	13¾
San Antonio	10¼

Furnished by Hornblower & Weeks, N. Y.

ST. LOUIS	Apr. 17	
N. of Com.	High.	Low.
Adams	.40	.30
Am. Nettie	.07	.04
Center Cr'k	1.80	1.50
Cent.C.& C.	81.00	80.00
C.C. & C. pd.	80.00	79.00
Cent. Oil	105.00	100.00
Columbia	7.00	5.00
Con. Coal	20.00	19.00
Doe Run	110.00	100.00
Gra. Bimet.	.20	.17
St. Joe	12.00	11.00

LONDON	Apr. 21		
Name of Com.	Clg.		
Dolores	£1	5s	0d
Stratton'sInd.	0	3	1½
Camp Bird	1	3	9
Esperanza	2	17	0
Tomboy	1	1	3
El Oro	1	4	9
Oroville	0	11	6

Cabled through Wm. P. Bonbright & Co., N. Y.

NEVADA STOCKS. Apr. 21.
Furnished by Weir Bros. & Co., New York.

Name of Comp.	Clg.
COMSTOCK STOCKS	
Belcher	.46
Best & Belcher	.42
Caledonia	.19
Challar	.08
Comstock	.23
Con. Cal. & Va.	.65
Crown Point	.53
Exchequer	.25
Gould & Curry	.11
Hale & Norcross	.20
Mexican	.85
Ophir	1.20
Overman	.15
Potosi	.14
Savage	.24
Sierra Nevada	.23
Union	.39
Utah	.02
Yellow Jacket	.69
TONOPAH STOCKS	
Belmont	1.00
Extension	.48
Golden Anchor	...
Jim Butler	.15
MacNamara	.30
Midway	.32
Montana	.65
North Star	.03
Tono'h Mine of N.	7.12½
West End Con	.30
GOLDFI'D STOCKS	
Adams	.02
Atlanta	.13½
Blue Bell	.04½
Booth	.20
Columbia Mt.	.13
Comb. Frac.	1.08
Con. Red Top	.07
Cracker Jack	.04
Dia'dfield B. B. C.	.06
Goldfield Belmont	.04
Goldfield Daisy	.42½
Great Bend	.17
Jumbo Extension	.17
Kendall	.06
Lone Star	.06
May Queen	.04
Oro	.11
Red Hill	.12
Roanoke	...
Sandstorm	.13

Name of Comp.	Clg.
Silver Pick	.23
St. Ives	.14
Triangle	.02
BULLFROG STOCKS	
Gibraltar	.04
Homestake King.	.03
Mont. Shoshone C.	1.75
Tramp Cons.	.05
MISCELLANEOUS	
Bonnie Clare	19.87½
Lee Gold Grotto	...
Nevada Hills	1.18¾
Nevada Smelting.	1.00
Nevada Wonder	.70
Nevada-Utah	2 75
Penn-Wyoming	.03
Pittsburgh S. Pk.	.60
Rawhide Caol't'n.	...
Round Mt. Sphinx	.12

COLO. SPRINGS	Apr. 16
Name of Comp.	Clg.
Acacia	.06½
Black Bell	....
C. C. Con	‡.03½
Dante	.06⅛
Doctor	.08⅛
Elkton	.63
El Paso	.45⅛
Findlay	.16
Gold Dollar	.10
Gold Sovereign	‡.03
Isabella	.22
Jack Pot	.06⅝
Jennie Sample	.07⅜
Jerry Johnson	‡.06¼
Mary McKinney	.37⅞
Pharmacist	‡.03
Portland	.87⅜
Un. Gold Mines	.06¼
Vindicator	.62½
Work	.07

Assessments

Company.	Delinq.	Sale.	Amt.
Blackjack Con., Utah	Apr. 15	May 7	$0.01
Blue Wing, Ida	May 8	June 5	0.005
Carney Copper, Ida	Mar. 25	May 1	0.003
Crown Point, Nev	Apr. 18	Apr. 28	0.10
Echo, Ida	May 1	June 1	0.002
Elk M. & M., Ida	Apr. 20	May 20	0.001
Exchequer, Nev	May 5	May 26	0.05
Imlay, Nev	Apr. 6	Apr. 28	0.03
Laclede, Ida	Apr. 7	May 1	0.003
Mexican, Nev	Apr. 8	Apr. 29	0.10
Nev. Superior	Apr. 10	May 1	0.07½
N. Y. Bonanza, Utah	Apr. 7	Apr. 28	0.03
Reindeer C. & G., Ida	Apr. 28	May 28	0.005
Rexall S. & C., Utah	Mar. 26	Apr. 25	0.01½
Savage, Nev	Apr. 8	May 5	0.10
Sierra Nevada, Nev	May 4	May 25	0.10
Union Con., Nev	Apr. 8	Apr. 30	0.10
Utah, Nev	May 6	May 27	0.03
Yellow Jacket, Nev	Mar. 17	Apr. 24	0.15
Yerington Gold, Nev	Apr. 8	May 12	0.005

Monthly Average Prices of Metals

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.788	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	54.505	.....	25.133	.....
May	52.795	.....	24.377	.....
June	53.663	.....	24.760	.....
July	53.115	.....	24.514	.....
August	51.683	.....	23.858	.....
September	51.720	.....	23.877	.....
October	51.431	.....	23.725	.....
November	49.647	.....	22.933	.....
December	48.769	.....	22.493	.....
Year	52.864	.....	24.402	.....

New York, cents per fine ounce; London, pence per standard ounce.

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January	13.726	13.893	13.901	14.280	62.386	57.688
February	12.905	12.949	13.098	13.295	58.786	61.197
March	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	.....	12.928	.....	58.331	.....
May	12.598	.....	12.788	.....	57.387	.....
June	12.675	.....	12.877	.....	57.842	.....
July	12.702	.....	12.933	.....	57.989	.....
August	13.462	.....	13.639	.....	60.500	.....
September	13.388	.....	13.600	.....	60.338	.....
October	13.354	.....	13.646	.....	60.139	.....
November	14.130	.....	14.386	.....	63.417	.....
December	14.111	.....	14.411	.....	62.943	.....
Year	13.208	.....	13.424	.....	59.902	.....

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	.....
February	28.978	28.290	August	29.942	.....
March	30.577	28.727	September	28.815	.....
April	31.702	.....	October	29.444	.....
May	30.015	.....	November	30.348	.....
June	28.024	.....	December	29.154	.....
			Av. year.	29.465	.....

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	.....	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	.....	.....	13.469	.....
May	4.253	.....	.....	12.938	.....
June	4.466	.....	.....	12.600	.....
July	4.447	.....	.....	13.000	.....
August	4.580	.....	.....	13.375	.....
September	4.515	.....	.....	13.125	.....
October	4.351	.....	.....	13.375	.....
November	4.330	.....	.....	13.538	.....
December	4.213	.....	.....	13.156	.....
Year	4.200	.....	.....	13.439	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.513	5.141	4.363	4.991	20.563	21.425
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	.....	4.495	.....	21.344	.....
May	4.608	.....	4.458	.....	19.906	.....
June	4.543	.....	4.393	.....	19.000	.....
July	4.485	.....	4.338	.....	19.031	.....
August	4.702	.....	4.556	.....	19.360	.....
September	4.769	.....	4.619	.....	19.563	.....
October	4.801	.....	4.651	.....	19.750	.....
November	5.059	.....	4.909	.....	20.875	.....
December	5.137	.....	4.987	.....	20.625	.....
Year	4.726	.....	4.578	.....	20.163	.....

New York and St. Louis, cents per pound. London in pounds sterling per long ton.